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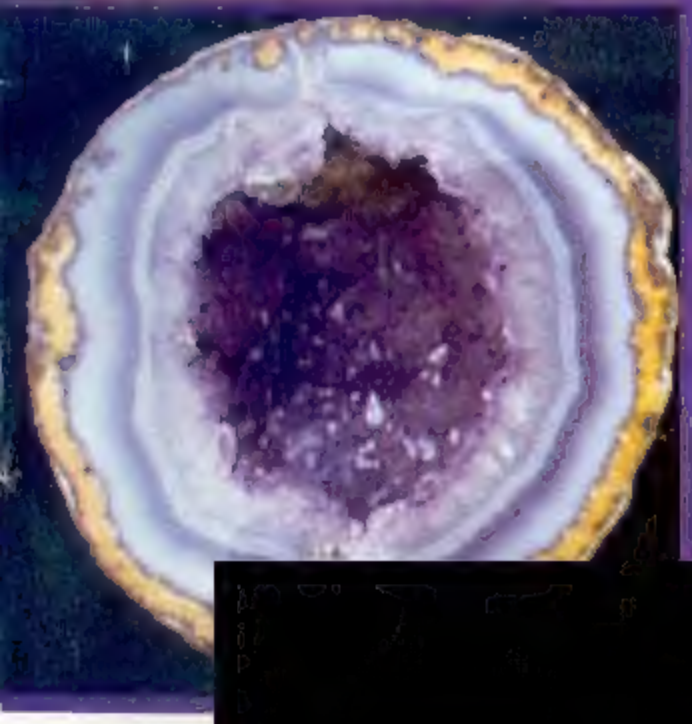

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COVER: These beautiful sugilite pieces are from the Wessels Mine in South Africa. They are currently in the collection of Colbaugh Processing Inc. in Kingman, Arizona. (Photo by Earl Lewis)

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BEYOND THE MINERALS

Lesser-Known Localities Produce Superb Specimens

by Bob Jones

Africa's mineral heritage goes far beyond Tsumeb. That great copper-lead-zinc deposit has given up a greater number of species and perhaps more specimens than any other African locality, but that's not the entire story.

Consider Morocco, source of choice cerussite, some of the world's greatest vanadinites, superb azurites, fantastic anglesites, colorful cobaltocalcite, lovely orange wulfenites, and bladed white barite. Then there are the other mines near Tsumeb: Kombat, with its spectacular gemmy cerussites, and Abenab, near Grootfontein, with its richly resinous descloisites.

In the region formerly known as the Belgian Congo, now Zaire, the rich uranium and copper mines of the entire Kolwezi Klippe, better known as the Shaba Region, have been especially productive. Rare and spectacular uranium minerals like cuprosklodowskite and metatorbernite, as well as such rare breeds as becquerelite, kasolite and fourmarierite, have come from this region. They are complemented by colorful cuprite and cobaltian calcite.

For those who like to collect rare species in showy crystal groups, there are things like hopeite, parahopeite and kermesite from the Globe and Phoenix mines in Broken Hill, Que Que, Zimbabwe (known as Rhodesia when these rarities were found). So while Tsumeb is a major player on the African mineral scene, other ore deposits on that continent have been sources of very showy collector specimens.

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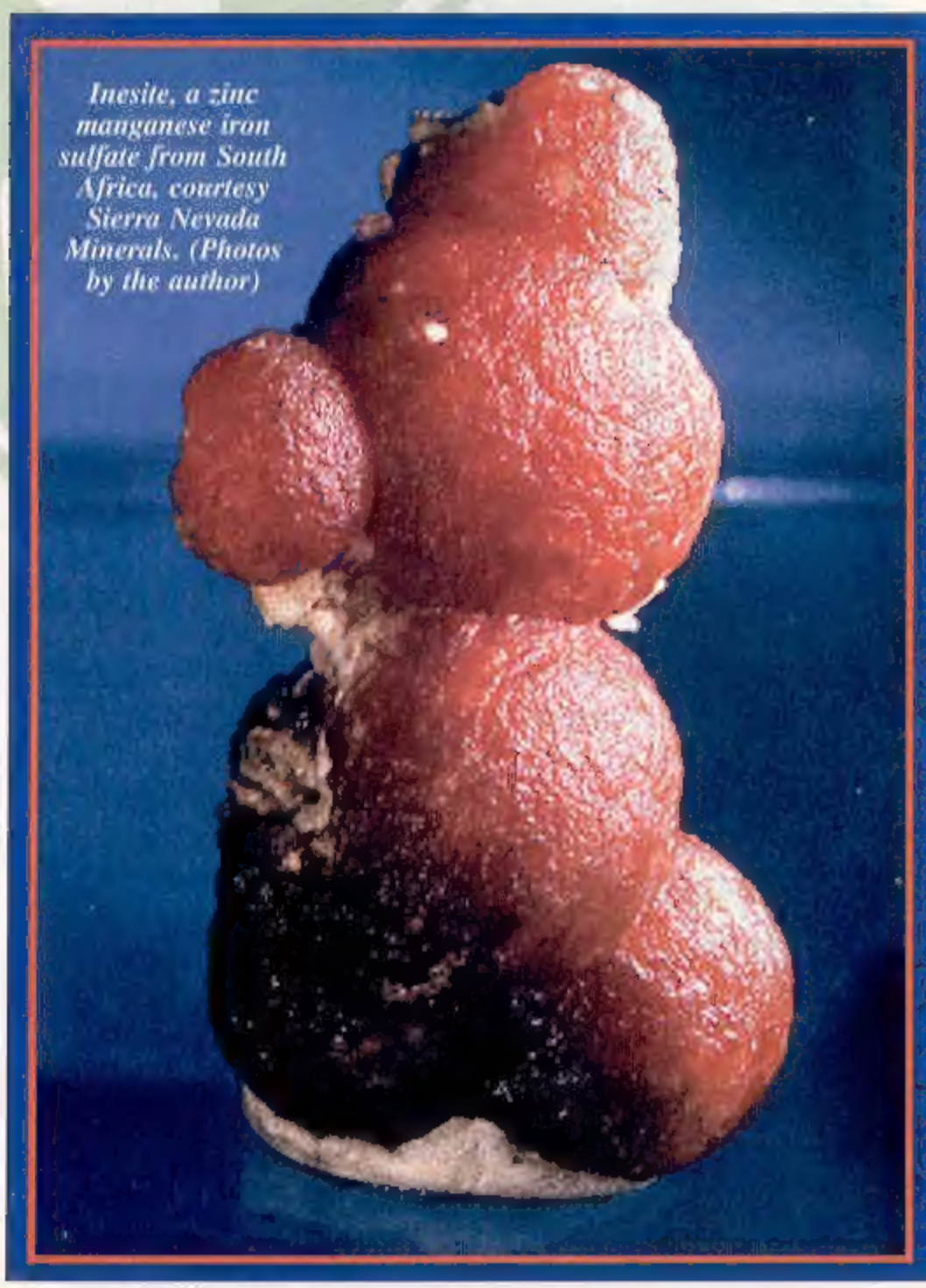


Inesite, a zinc manganese iron sulfate from South Africa, courtesy Sierra Nevada Minerals. (Photos by the author)

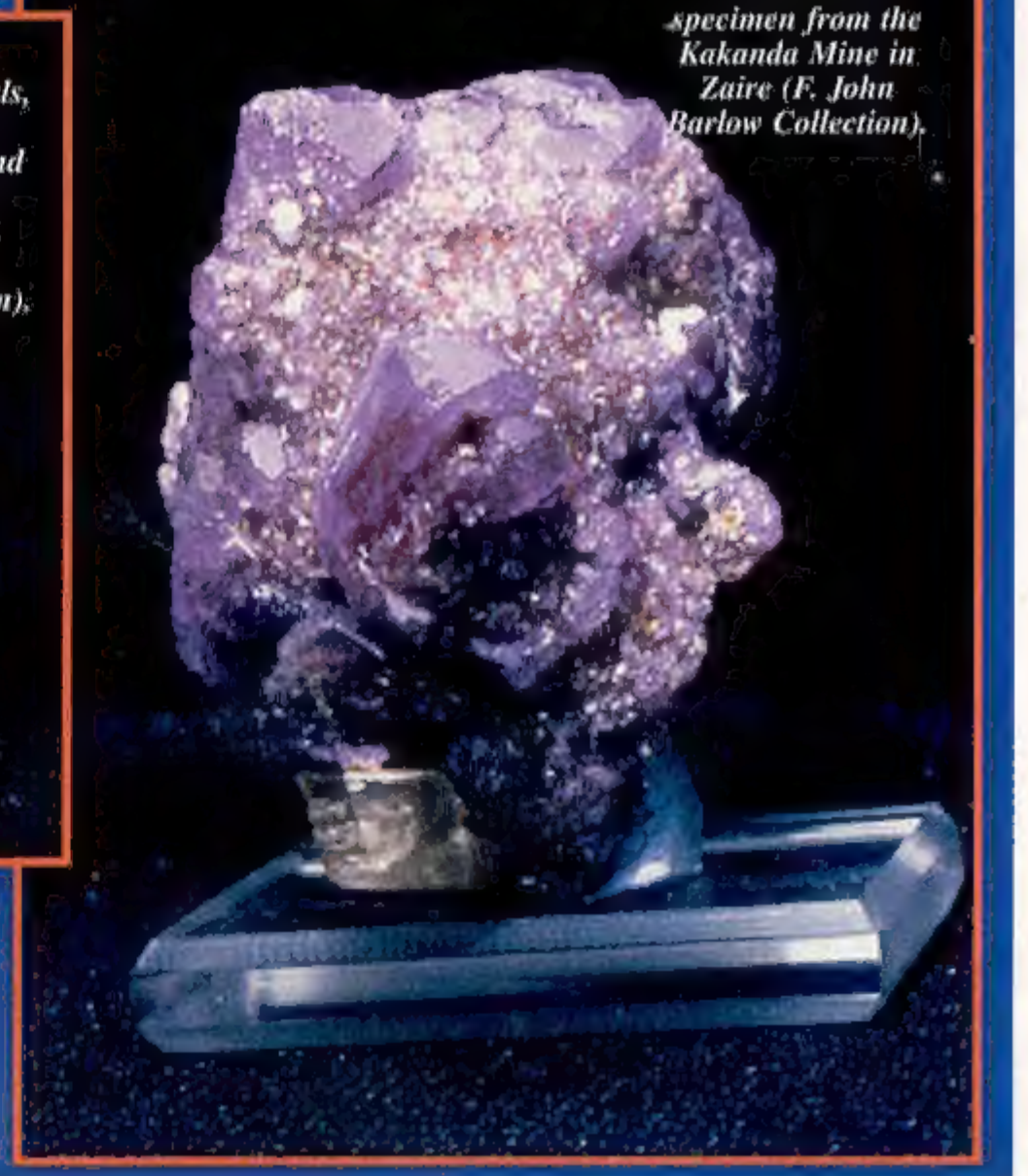
Moroccan azurite crystals from the F. John Barlow Collection.

TSUMEB: OF AFRICA

Cobaltian calcite from the Shaba Province of Zaire perches on a base of malachite. (Jack Halpern Collection).

The finest anglesite from the Toussit Mine is a bright canary yellow (F. John Barlow Collection).

Tiny calcite crystals, infused with chalcothrichite and associated with malachite, from Tsumeb (Jack Halpern Collection).



Cobalt causes the delicate violet color in this dolomite specimen from the Kakanda Mine in Zaire (F. John Barlow Collection).

Beyond Tsumeb *from page 12*

Bou Azzer produced a wonderful suite of cobalt minerals including superb bladed erythrite (Evan Jones Collection).

Several hundred years ago, copper was being mined by the local indigents in Central Africa. This richly mineralized area was known to explorer David Livingstone in the early 1800s, though he never actually visited the deposits. By 1911, both copper and cobalt were being mined there in a limited way.

When uranium minerals were a hot ticket after World War II, the huge Central African uranium deposits were worked intensively. Collectors know the Shinkolobwe Mine best for its amazing torbernite (really metatorbernite) and cuprosklodowskite. These brilliantly colorful secondary minerals are very showy and are found in rich clusters.

Torbernite is an unstable copper uranyl phosphate. When exposed to the atmosphere, it immediately begins to stabilize as metatorbernite. This has little, if any, effect on the vibrant dark- to light-green platy blades. Most of these thin, platy crystals have a dark-green center grading slowly to a lighter green on the crystal edges. The dark centers are due to included microgranules of uraninite. Tightly packed clusters of these lovely, green, squarish blades are extremely showy, but are no longer being found.

Cuprosklodowskite from Musonoi consists of superb light-green needles in radiating clusters that often fill large vugs with color. The needles seldom exceed 2 inches, but these specimens are particularly attractive and showy. The mineral is named after its copper (cupro-) content and Marie Curie, whose maiden name was Sklodowska. Musonoi is just one mining area in what is called the Shaba Crescent, a major copper-producing area in Zaire.

The nearby Mashamba West Mine produced wonderful cuprites, nice 1-inch octahedrons usually coated with a soft, light-blue chrysocolla. Underneath that blue, dusty coating rest gemmy red octahedrons.

The most common gangue mineral at this mine is calcite, often found in typical dogtooth crystals measuring up to an inch or more. But calcite collectors really got excited about the rich pink cobaltian calcite crystals that were found abundantly about 15 years ago. Coupled with a blue chrysocolla matrix, these splendid crystals display beautifully. The color in these cobaltian calcites is due to the transition metal element cobalt, which makes up about 1 percent of the whole.

The Broken Hill mines of Zimbabwe (not to be confused with that great deposit in Australia) produced some very fine collector minerals, minerals considered rare today. Best known are the dimorphs hopeite and parahopeite. Both are zinc phosphates with different crystal structures. Hopeite is orthorhombic, while parahopeite is triclinic. These rare species occurred at the Globe and Phoenix mines at Que Que.

Hopeite is grayish white, usually with a yellowish tint. The crystals, seldom over ½ inch, developed in tight clusters. Parahopeite is similar, but is often coated with brown iron oxide. The interesting thing about hopeite is that it was found in a limestone cavern in the mine. I recall a particularly fine specimen that was in the Mark Chance Bandy Collection, now in the Los Angeles County Museum of Natural History. It's worth seeing.

Two Namibian specimen sources that are close to Tsumeb are the Kombat and Abenab mines at Berg Aukus, Grootfontein. Berg Aukus was the source of the finest descloisites ever found in Africa. In tightly clustered spear-pointed crystals, often very fragile, these lovely lead specimens were abundant more than 20 years ago. On a visit to the Abenab Mine several years ago, I could see only abandoned houses scattered on a hillside.

The color of these descloisites ranged from light to deep brown, with a resinous luster. The crystals looked very much like arrowheads with an odd, rounded thickening of each crystal near its base. The edges transmit light, revealing a lovely light-brown color.

The Kombat Mine is not known for a large variety of species, but it did produce some absolutely breathtaking water-clear to white V-twinned cerussites. Reaching well over 2 inches at times, these textbook beauties were found loose, sans matrix, and caused quite a stir.

In the northern part of Africa is the country of Morocco. Two different mining districts, Bou Azzer and Touissit, have done their share to supply collectors with gorgeous specimens.

From deep in South Africa comes the rare sulfide platinum mineral sperrylite. The platinum deposits of the Bushveld Complex are significant. Crystals are rare; they are found in a complex sulfide-type deposit of platinum, nickel and the like. The specific localities are Rustenburg, Potgietersrust and Insizwa, South Africa.

The finest platinum sulfide crystal from the Bushveld Complex is a single 1-inch crystal in matrix on display at the British Museum of Natural History. The crystal is actually only loosely resting on the matrix, from which it was removed. The original exposed surface of the crystal is damaged, so the crystal has been inverted and put back in matrix to display a brighter countenance.

While my son Evan and I were visiting the British Museum many years ago, Curator Peter Embrey was kind enough to allow 7-year-old Evan to pick up this loose specimen. The sperrylite crystal immediately fell from its matrix into his hand. Evan was, to say the least, chagrined, until Peter chuckled over his shocked expression and Evan realized everything was OK. Peter also taught us a wonderful poem about peas on a knife with mashed potatoes!

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Beyond Tsumeb *from page 14*

Bou Azzer has been primarily a cobalt mine, producing such lovely minerals as skutterudite, a cobalt arsenide. These steely gray crystals are popular among serious species collectors. This deposit also produced a gorgeous magenta-violet mineral, erythrite. It is found in platy bladed crystal groups. A few very fine specimens were found at Bou Azzer in recent years, harkening back to the good old days of important production.

The Toussit area is the home of the world's most attractive vanadinites, shimmering red simple hexagonal crystals sometimes approaching 2 inches in length. These gems frequently stack onto each other to make very showy, almost castellated clusters. The blood-red color of the larger crystals often grades to a rich orange toward the crystal edges. This only makes the crystals more attractive.

Not all Toussit-area vanadinite is a rich red. When a small percentage of arsenical oxide gets into the structure, the color is a waxy brown or tan, sometimes coming close to yellow. Many of these specimens were called descloizite, but few really are.

There is descloizite present, however. The matrix holding those lovely red vanadinite crystals may be sprinkled with microcrystals of nearly black zinc-lead vanadate. This has been shown to be descloizite, though some specimens are labeled mottramite, a copper-lead vanadate that forms a series with descloizite.

The Acif Mine has been producing the finest vanadinite lately. Recalling the good old days when Toussit was the big producer, the Acif Mine is being prospected diligently by local diggers, who take risks beyond good reason.

Vanadinite isn't the only showy collector mineral found around Toussit. Breathtaking cerussite, even finer anglesite, bright-blue azurite, white-bladed barite, and luscious yellow-orange wulfenite have come from these lead mines. My favorites of all the lead mineral specimens are the beautifully colored wulfenite blades on and with white barite, a stunning combination.

The azurites from the Toussit Mine rank right up there with those from Tsumeb and Bisbee. Lovely rosettes of dark-blue blades, sharp, lustrous, single swordlike blades, radiating clusters of thin blades, and azurites coupled with malachite alterations have been recovered in huge quantities. At any given time, it has been possible to view 100 or more specimens in a dealer's inventory. Dealers make pilgrimages to this area because of the choice azurites still available there.

One species from Morocco created an even greater stir of excitement than the vanadinite and azurite from the Toussit Mine. The species is anglesite, a simple lead sulfate. The best Moroccan anglesites can be gemmy and perfectly terminated. The color is a delicate yellow to yellow-orange. The prism faces are striated, but that does nothing to distract from their beauty. Crystal clusters up to several inches across were common at one time. Single crystals to 2 inches were common, and some were considerably larger.

Then it happened! Someone figured out that anglesites could be cleaned with a bleach solution. The problem is that a strong bleach solution will turn ordinarily colorless to pale-yellow anglesites a rich orange-red color. Naturally, some shady types decided drab anglesites would sell a heck of a lot faster if they were that rich orange-red. The discovery of this effect occurred right at the mine, and that gave the "bleached" anglesites a degree of legitimacy for a while.

Research has shown that the red color comes from a thin layer of altered anglesite, which gives the crystal a marketable color overcoat. So if you check out anglesites for your collection, be wary when you see a bright red-orange crystal from Morocco. It just might be a fugitive from a bleach tank.

From the Wessels Mine of the Kalahari Manganese Fields in the desert of South Africa, several superb minerals have come, including rhdochrosite and sugilite, which I have already described in companion articles. Another choice mineral from this same manganese mine is sturmanite. This bright-yellow, bipyramidal, complex calcium manganese mineral is very showy. It was found in several pockets in the mine. The largest crystals are in excess of an inch, can be doubly terminated and, unfortunately, are subject to alteration. Sturmanite will change from a bright, showy yellow to a dull, unattractive brown if exposed to sunlight, excess moisture, or other destabilizing conditions. It is best kept in a dry, dim, stable environment.

Any article on Africa would be remiss if South Africa's gold were left out. Unfortunately, crystals or even specimens of massive gold suitable for display are almost never seen; the yellow metal is simply too sparsely disseminated in the rock. Still, the odd specimen does emerged unscathed in spite the destructive efforts of both nature and mining.

This and other articles are just brief summaries of what has come from the vast African continent. I hope they will give you some background information in preparation for viewing the many exhibits at the Tucson Gem & Mineral Show in February. It may also be a helpful guide should you wish to expand the African mineral section of your collection.

SHOP TALK

by William A. Kappele

CAB SANDING

If you have been disappointed in the polish on your cabs and have been experimenting with different polishes, buffs and techniques with no improvement, then the problem may well be not in the polishing stage, but in the sanding. "Sanding" is one of those terms that really don't make much sense, since no sand is involved. It undoubtedly goes way back to a time when sand actually was used to smooth surfaces—primarily wood. Be glad that we have much better smoothing agents today.

Modern "sand" is usually either silicon carbide, a man-made material with a hardness approaching that of diamond, or industrial diamond. Which one to use is one of those Ford and Chevy decisions; either will do a fine job. Silicon carbide is cheaper, but wears out faster than diamond. Diamond is more expensive, but lasts a long time. Silicon carbide comes on discs and belts as does some diamond, but a pad can also be "charged" with diamond by using a syringe with the proper size grit.

Whichever sanding medium you decide to use, the purpose is the same: to remove the scratches left by the grinding stage and leave scratches fine enough to be removed by the polishing stage. I need to stop here and explain this concept of scratches. A reader once wrote me and took me to task for being a sloppy lapidary. (I may be, but not for the reason he gave.) He told me that if I wouldn't put scratches on the piece in the first place, I wouldn't have to worry about getting them out. Well, the fact is that the process of getting a shine on an object—whether it be the 27-coat lacquer job on your Porsche, the coffee table you just varnished, or a cabochon—is one of using finer and finer grits to produce finer and finer scratches, until they are no longer visible to the naked eye.

One of the critical things to avoid—and this is what my critic meant—is getting 100 grit scratches in your 220 grit finish, or 220 grit scratches in your 320 grit finish. This can easily happen if you are careless in your cleanup between grits. A fairly standard grit selection is 100 for the grinding, followed by sanding with 220, 320 and 600. These are silicon carbide designations; diamond has a different numbering system. It is extremely important to clean everything thoroughly—make that THOROUGHLY—every time you change grits. Wash the stone. Wash your hands. Clean up anything around the machine that could drop a piece of grit onto the wheel or the stone.

Another trick is to rotate your stone 90 degrees at each grit change. If your final grind is done on the long axis of the cab, make the first sanding on the short axis. This way, you can tell when all of the long axis scratches are gone, which means you are ready for the next grit. Of course, you should have a good light source at your machine so that you can see the scratch pattern well. It also helps not to be so vain that you scoff at using a magnifying glass or a loupe. If you are striving for the perfect cab, and you should be, then you don't want to leave anything to chance.

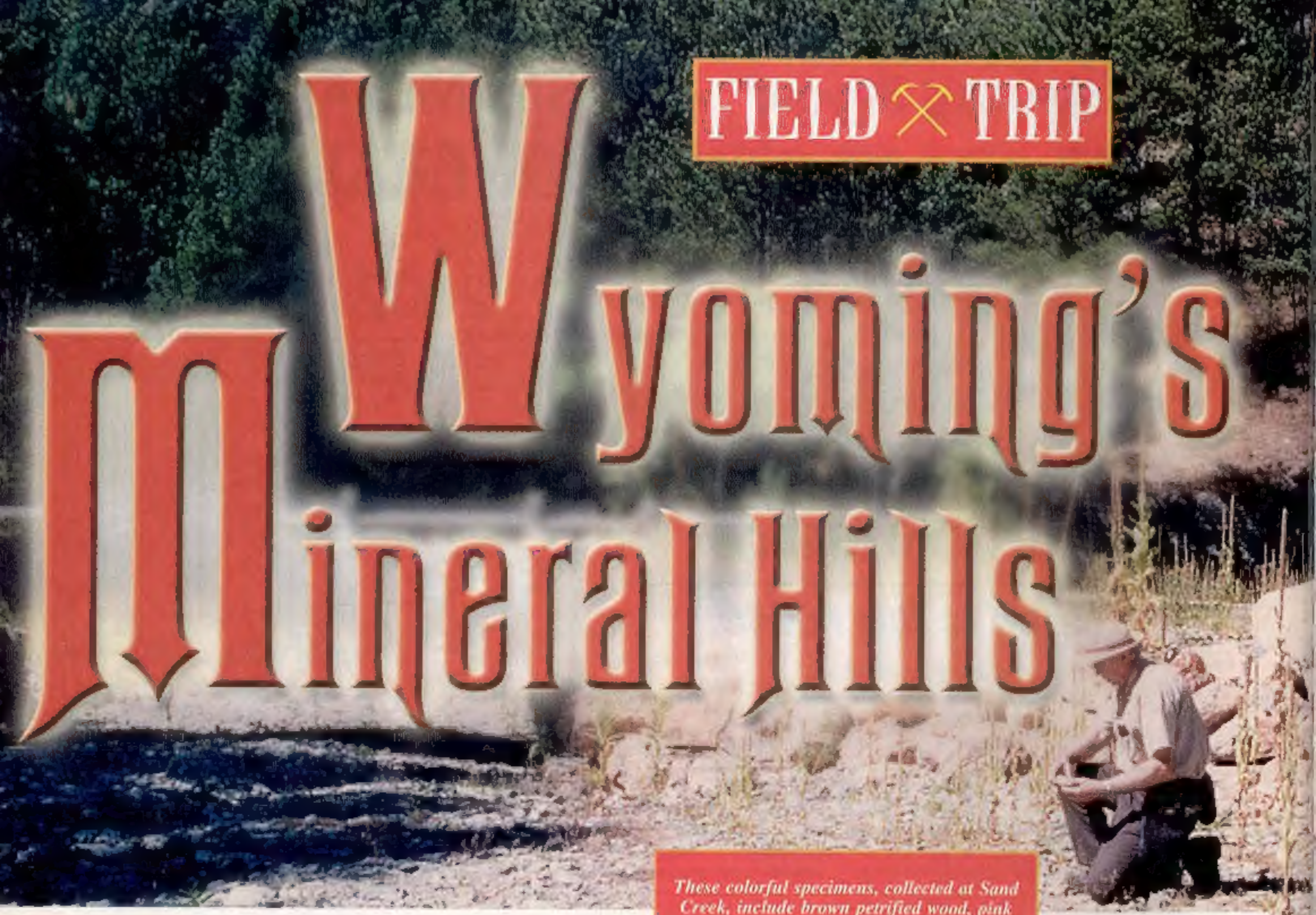
When you finish the 600 grit step and there are no 90 degree scratches from the 320 step, you are ready to polish. Go through your litany of washing and cleaning and see what happens with the polish. If you still are not satisfied, try going back to the sander and using a well-worn 600 disk or belt or, if you are using diamond, switch to a finer grit.

Happy sanding!

Please feel free to contact me if you have a suggestion or comment about this or any of my Shop Talk columns. My e-mail is quappelle3@home.com, or write to me at 25231 Pericia Dr., Mission Viejo, CA 92691.

FIELD TRIP

Wyoming's Mineral Hills



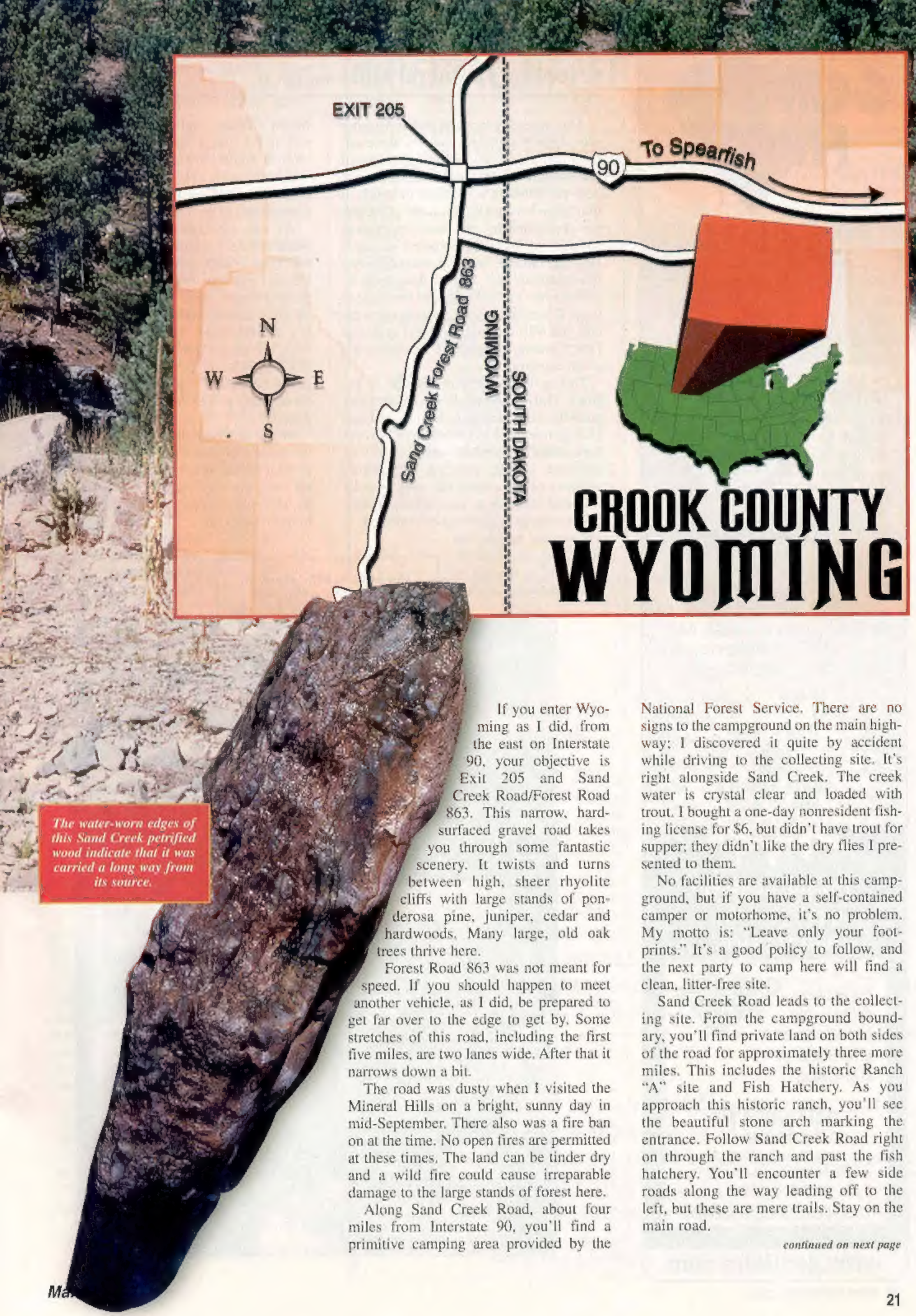
These colorful specimens, collected at Sand Creek, include brown petrified wood, pink rhyolite, red jasper, and blue, lavender, yellow and brown banded agate. (Photos by the author)

A Variety of Mineral Specimens Awaits the Determined Collector

by Kenneth H. Rohn

If you crave a little solitude, desire to experience beautiful scenery, and have a strong urge to collect agate, petrified wood, banded rhyolite and various marine fossils, you can't go wrong by visiting the Mineral Hills area of Wyoming.

First off, you aren't liable to meet too many folks in this area. The population of Wyoming at the 2000 census was 479,500. The people here are courteous, friendly and eager to help.



The water-worn edges of this Sand Creek petrified wood indicate that it was carried a long way from its source.

If you enter Wyoming as I did, from the east on Interstate 90, your objective is Exit 205 and Sand Creek Road/Forest Road 863. This narrow, hard-surfaced gravel road takes you through some fantastic scenery. It twists and turns between high, sheer rhyolite cliffs with large stands of ponderosa pine, juniper, cedar and hardwoods. Many large, old oak trees thrive here.

Forest Road 863 was not meant for speed. If you should happen to meet another vehicle, as I did, be prepared to get far over to the edge to get by. Some stretches of this road, including the first five miles, are two lanes wide. After that it narrows down a bit.

The road was dusty when I visited the Mineral Hills on a bright, sunny day in mid-September. There also was a fire ban on at the time. No open fires are permitted at these times. The land can be tinder dry and a wild fire could cause irreparable damage to the large stands of forest here.

Along Sand Creek Road, about four miles from Interstate 90, you'll find a primitive camping area provided by the National Forest Service. There are no signs to the campground on the main highway; I discovered it quite by accident while driving to the collecting site. It's right alongside Sand Creek. The creek water is crystal clear and loaded with trout. I bought a one-day nonresident fishing license for $6, but didn't have trout for supper; they didn't like the dry flies I presented to them.

No facilities are available at this campground, but if you have a self-contained camper or motorhome, it's no problem. My motto is: "Leave only your footprints." It's a good policy to follow, and the next party to camp here will find a clean, litter-free site.

Sand Creek Road leads to the collecting site. From the campground boundary, you'll find private land on both sides of the road for approximately three more miles. This includes the historic Ranch "A" site and Fish Hatchery. As you approach this historic ranch, you'll see the beautiful stone arch marking the entrance. Follow Sand Creek Road right on through the ranch and past the fish hatchery. You'll encounter a few side roads along the way leading off to the left, but these are mere trails. Stay on the main road.

continued on next page

Wyoming's Mineral Hills *from page 21*

After emerging from the arch at the other end of the Ranch "A" property, drive another four miles to the collecting site. When you come to the bridge over the dry creek bed, you'll find a wide place in which to turn around and park. This is the collecting site. (I presume the creek is only dry during late summer and fall.) If you are driving a large motorhome, you may have difficulty turning around here. You can drive about 11 miles to Idol Gulch bridge and turn around there. If you follow Sand Creek Road to the end, you will come to U.S. Highway 85 and Four Corners. (I wouldn't advise it; it's rough and dusty.)

This collecting site is situated in the Black Hills National Forest. Collecting guidelines are similar to Bureau of Land Management (BLM) regulations, except the amount of petrified wood that may be collected is not specified. Reasonable amounts of other minerals may also be collected, as well as invertebrate fossils. No vertebrate fossils may be collected.

From the bridge, the collecting site extends upstream, to the left of the road, for an undetermined distance, and downstream all the way to the first private fence near Ranch "A," so you'll have a very large area in which to collect. This dry creek is a different branch from the fast-flowing one downstream at the hatchery.

As with any collecting site, it took a while before I began recognizing "keepers." I had to walk upstream for quite a way before I saw my first interesting rock, a piece of purple jasper. Then I began to pick up an occasional banded agate specimen. It's understandable that the easy access areas are always going to be picked over first. If you walk upstream or downstream just a bit farther than the average rockhound has, you're bound to find better material.

In my slow searching, I found dozens of samples of water-worn fossil sponges or what appear to be receptaculites. These are probably from the late Ordovician or the Devonian System, 430 million to 255 million years ago. The color of these specimens varies from a golden yellow to gray, and often dark pink. I saw one piece that, although it was well rounded by water action, was a foot in diameter and at least 8 inches thick. It was bright yellow. I don't know whether these fossils would be good for anything more than display specimens, but perhaps slicing a piece with a diamond saw might unlock the beauty within. These specimens are porous and have lumpy walls, somewhat like the sponges found today.

This large, colorful chunk of rhyolite was found a good distance upstream from the bridge at Sand Creek.

Chunks and blocks of bright-pink to dark-red rhyolite litter the creek bed in places. Some are nicely banded with contrasting lighter colors. Most of it looks rather porous and may not take a good polish, although I'm sure a few pieces are solid enough.

The agate found here is quite dense. In many respects it resembles jasper. When I began to discover the banded ones, they stood out most prominently amongst the rocks and pebbles of rhyolite, granite, milky quartz and shale. It's remarkable how much the material resembles petrified wood, with the bands seeming to duplicate tree rings to an outstanding degree. Many of the pieces I picked up are rather small, but a few may weigh as much as a pound or more. The bands are a colorful contrast to the body of the stone. I have one magnificent piece that will make an excellent cabinet specimen. It has a gray texture overall with white, gray, yellow, pink and lavender bands. These bands are tightly grouped together. Some of the bands in the yellow section are so closely spaced that I had to use an eye loupe to discover them.

While walking upstream, I discovered a piece of petrified wood about the size of a golf ball. It has circular bands of cream, gray, brown and black, with an overall coloration of light blue. The bands on this piece are rather far apart, suggesting a soft wood, such as pine. I found several other water-worn pieces of "wood" that are dark brown with very dark brown, almost black, growth rings. The rings are spaced tightly together, which could suggest several dozen stunted growing seasons due to cold or perhaps drought conditions. One piece that I picked up is black, with brown rings throughout. It's not very large, about 1 inch by ¾ inch by 2 inches.

The majority of the material found in this location is water worn, which means that at certain times of the year, water rushes down this creek bed at an alarming rate of speed. Use caution in early summer if you visit here. Flash floods come about without warning.

Some of the petrified wood found along Sand Creek Road is a pretty golden brown with orange and lighter yellow growth rings. One piece I found is as large as a goose egg. It appears to be a limb section. The tiny heart in this piece is well defined—a small circle right in the center.

I collected both upstream and down-

continued on next page

stream with good results, so long as I went a bit farther than the average collector. I had my best luck while searching downstream for a distance of up to a mile from the bridge.

I picked up a beautiful piece of chalcedony on the last outing of my three-day stay. It fills the palm of my hand. One side was chipped off, exposing a yellowish-gray center with very faint outer rings of blue, white and gray. The outer crust is a drab whitish gray, hiding the beauty within. I would have easily passed this drab rock by had it not been for that revealing fracture.

During my outings, I found a very large crystal structure that appears to be axinite and is translucent to some extent in the crystal points. It's water worn, and that makes it somewhat difficult to identify. The overall structure resembles axinite, and it gave off a white streak – the proper color streak for this mineral. Axinite has a hardness of Mohs 6.5 to 7 and a specific gravity of around 3.27. The piece I found is heavy and of a light-brown color, and the many small, formerly sharp crystal points indicate that it is axinite. The name comes from the Greek word for ax.

The specimen is 7 inches long and about 4 inches in diameter, with a weblike structure covered with crystal points. Although many are worn off, the piece as a whole is very attractive. Here and there, I found tiny matchhead-size rocks imbedded in the voids, cemented very tightly in place. An overnight soaking in a solution of vinegar and table salt will clean it nicely.

Many of the stones found in the creek bed are mere rounded pebbles, indicating that much water action has taken place in this stream over the centuries. The streambed cuts through very high, sheer rhyolite cliffs of various red and pink layers of massive rock. Huge ponderosa pines line the banks, and in some places I saw large trees growing right in the streambed. Huge chunks of bark have been gouged off some by the tumbling action of boulders during spring runoff. Yet, they continue to grow in this harsh environment. I did find some that had expired from the onslaught and lay in decay in the streambed.

In the course of my three-day stay in the Mineral Hills, I saw many mule deer. I counted a dozen in one group alone. I saw one elk as it darted across the road ahead of me. I watched eagles soaring on thermals high up above the bluffs every day. I watched 14 wild turkeys contentedly feed not 10 feet from my camper window. I even heard coyotes wailing under a full moon as I drifted off to sleep each night. It's a magnificent place.

There are abundant specimens of the fossil sponge (receptaculite) at the Sand Creek site.

The weather during my stay was excellent. It was a bit on the hot side, with temperatures nudging 80 degrees at midday. The sky was always a deep blue with high, cirrus clouds of the most unusual shapes. The nights were cool; temperatures dipped down to 42 degrees during my second night there. Take along light work clothes for rockhounding, long pants, a long-sleeved shirt, and a light jacket or sweater for cool evenings. Unless you already have a good tan, you will get sunburned wearing short sleeves. A hat, of course, helps keep the sun out of your eyes and protects you against heat stroke, and I recommend a good, sturdy pair of high top leather work shoes. They give your ankles good support while walking on rough ground. Always examine any rock or log that you intend to step over. Rattlesnakes like these places. For what it's worth, I didn't see any on this field trip.

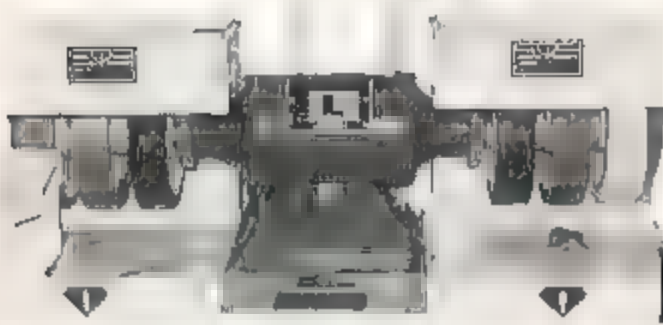
Always drink plenty of water in hot, dry weather. I always carry some with me on longer excursions into the backcountry. A can of pop and a candy bar can give you quick energy, as well. If I stay longer than three hours, I'll take along a sandwich and an orange or apple. Speaking of hot weather, dehydration comes upon one quite unexpectedly. The strange thing about it is, that when the process begins, you won't feel thirsty. It's well to keep this in mind.

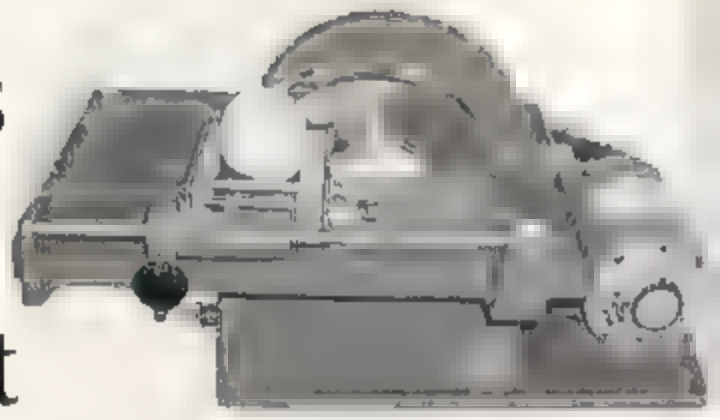
If you get your fill of collecting (I never do), there are a number of other things to keep you occupied. Just preparing a wholesome meal in camp can be considered an art. Fishing is always close at hand here. I like to strike out on my mountain bike, which I always take along on field trips. It gives me a chance to explore places where a motor vehicle can't usually go. An evening stroll is great to help settle the stomach after a big meal. Also, photography plays a large part in my field trips. I carry two 35 mm cameras; one is used purely for a backup. I also use my 2 ¼-inch larger format camera for photographing scenery. Sometimes, just relaxing in a lawn chair in camp is better than any medicine.

The Mineral Hills area of Crook County, Wyoming, is a good place to get away from it all for a few days, and at the same time, you can add to your rock collection on a grand scale. Without a doubt, if you search carefully, you'll leave the Sand Creek area with a good selection of pretty minerals.

Lapidary Equipment Buyer's Guide

An Array of Products for the New or Experienced Hobbyist





by William A. Kappele

A piece of lapidary equipment may not rank up there with a new car or a new house as a major purchase, but for most of us it is a serious investment in something that will be around for years. In fact, we may keep our saws, cabbers, etc. even longer than we keep our houses, and certainly longer than we keep our cars. One reason for this longevity is that, by and large, lapidary equipment is very sturdy and pretty basic. Unlike computers, which we change more often than our socks, a good saw will still be slicing slabs like new 20 years from now, and our grandchildren can still be grinding cabs on a good machine after we have gone to that big agate patch in the sky.

Obviously, if we are going to keep a machine for a long period of time, we should get what we want the first time. Who wants to be stuck with something they don't like for 20 years or so? No one does, so let's see if we can come up with some tips on how to avoid making a bad choice.

Before we discuss individual machines, there are some general considerations that apply to all purchases. First, how long has the manufacturer been in business? Those who turn out inferior products rarely stay in business for long. Of course, this does not mean that a new company cannot build superior products, but longevity is a good indicator of product quality.

Second, are parts like bearings, bolts, seals, gaskets and other fittings standard hardware items that are widely available? I've received lots of mail over the years from frustrated readers trying to find a part for a machine whose manufacturer has gone out of business. Most machines are very sturdy and last for years, but they are, after all, just machines, and sooner or later something will wear out.

Third, what kind of return policy is offered? If you are shopping by catalog or on the Internet and have no chance for hands on inspection before you purchase, can you return the machine if you are not satisfied?

Fourth, what is the length of the warranty and what conditions apply? Does it cover the whole machine and all of

its parts, or just selected pieces like the motor? I feel that a one year warranty is reasonable. Most defects in machines will show up fairly soon, so be sure you put the tool to use right away. I have been known to get busy and forget about a new purchase until the warranty was up. Don't do that. Don't get too excited about a lifetime warranty, either. I have a file folder full of warranties from stuff I have bought over the years. Some are "lifetime" warranties from companies that have been out of business for years.

Fifth is the question of price. There is no one who squeezes a penny tighter than I do, but price is not the sole, or even the best, determiner of whether to buy. If a machine is going to be used for many years, will give you lots of pleasure, and will run reliably, is it worth paying a little more? I say yes.

Finally, always make every effort to actually use the machine you are contemplating buying. You don't want to buy a particular type of machine and then find out that you really like another one better. This happens with diamond wheeled cabbing machines vs. disk machines, among faceting machines, which can vary quite a bit in how they operate, and between "swing arm" and "table-type" slab/trim saws.

It isn't possible in the space of this article to cover every manufacturer and each machine they make, so I have given brief descriptions of those machines I feel will appeal to the lapidary hobbyist. For more complete descriptions and information on additional machines, please use the contact information to obtain catalogs or brochures.

continued on next page

CONTACT INFORMATION

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Covington Lapidary Engineering
PO Box 35
715 W. Colton Ave.
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Fax: 909) 793-7641
E-mail: sales@covingtonengineering.com

Crystalite Corp.
PO Box 545
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Lewis Center, OH 43035
(740) 548-4855
Fax: 740) 548-7617
E-mail: custservice@crystalite.com
Web site: www.crystalite.com

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Barstow, CA 92312
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E-mail: diamondpacific@ao.com

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Web site: www.gearloose.com

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Web site: www.gravescompany.com

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Web site: www.facetron.com

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Web site: www.lapcraft.com.

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Fax (206) 789-3102
E-mail: equipment@lortone.com
Web site: www.lortone.com

Raytech Industries
475 Smith St.
Middletown, CT 06457
(800) 243-7163
Fax (860) 632-1699
Web site: www.raytechind.com

Richardson's Recreational Ranch
Gateway Rt. Box 440
Madras, OR 97741
(800) 433-2680

TAGIT
PO Box 1534
San Juan Capistrano, CA 92675
(562) 949-8380 or (949) 496-7742

Taylor Manufacturing
P.O. Box 1826
Rialto, CA 92377-1826
(909) 820-4860
Fax (909) 820-4860
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Tru Square Metal Products
640 First St. S.W.
Auburn, WA 98001
(800) 225-1017
E-mail: t-tumbler@qwest.net

Ultra Tec
1025 E. Chestnut Ave.
Santa Ana, CA 92701-6425
(714) 542-0608
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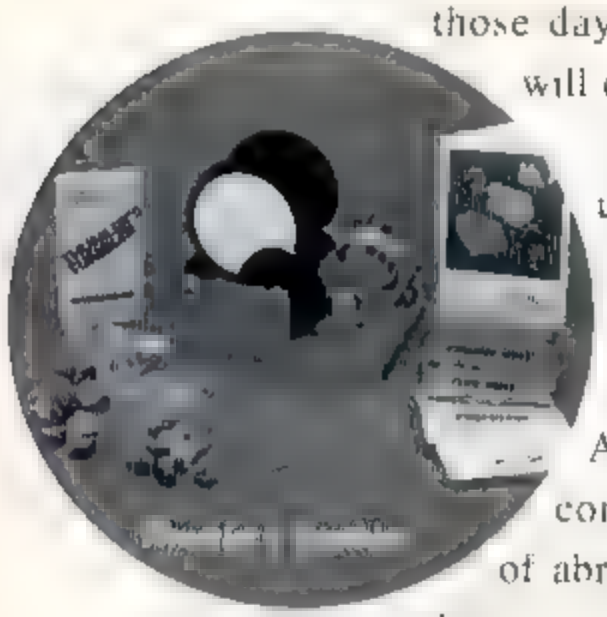
E-mail: info@ultratec-facet.com

ROTARY TUMBLERS

There are a lot of tumblers on the market by a lot of manufacturers, but they all fall into two general categories, vibratory and rotary. Your first decision will be which type to buy. There was a time when the vibratory tumblers were quieter and faster than the rotaries, but those days are gone. Either type will do a fine job



Tru Square Metal Products manufactures the Thumler's Tumbler in 10 different models. The 3 pound-capacity Model AR-1 Special Kit comes complete with four grades of abrasives, jewelry findings, and even a selection of rocks to tumble At $108 10, it won't break the bank and will get you (or the kids) into tumbling in a hurry.

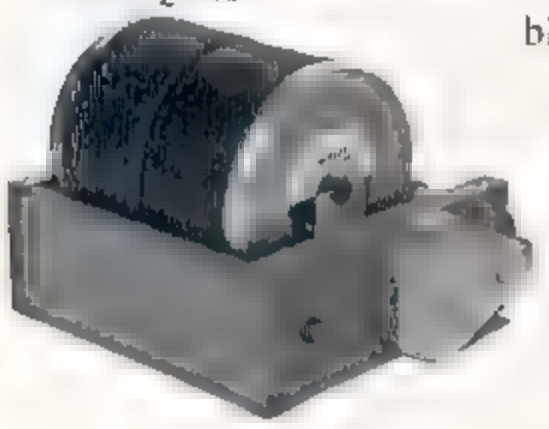
Lortone 1.5E

Lortone has been making lapidary machinery for over 40 years, so if practice does in deed make perfect, they should be getting close. For the beginner or the occasional tumbler, they offer either the 1½-pound-capacity Model 1.5E at $54 or the 3-pound capacity Model 3A at $62. Both have molded rubber barrels and a "sure seal" closure to keep the slurry where it belongs.

Lortone 3A

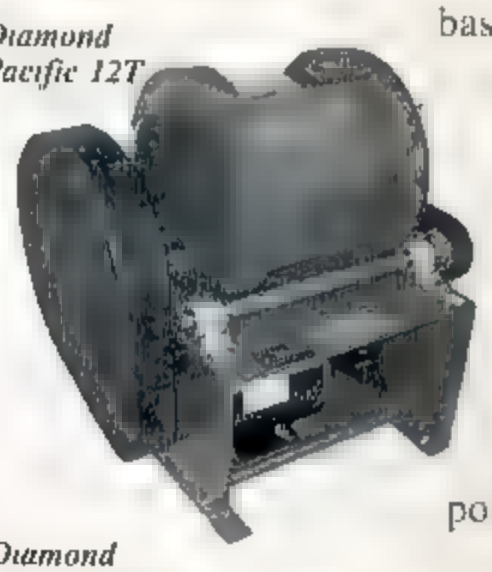
For the serious tumbler, Lortone has the Model QT-66 With a 6-pound-capacity molded rubber barrel, the same "sure seal" closure as the smaller tumblers, a welded steel frame, a heavy-duty motor, and a price tag of $160, this unit will take care of your larger tumbling projects.

Lortone QT-66

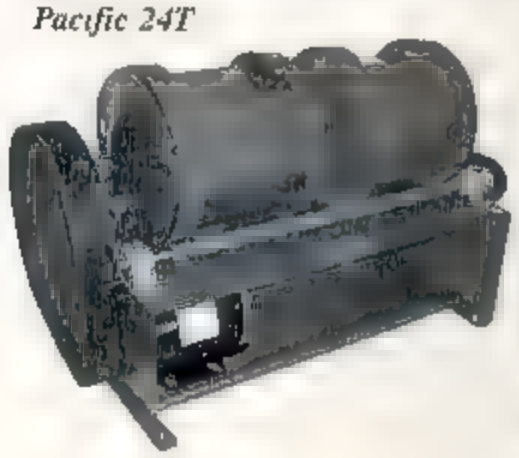


Diamond Pacific Tool Corp. has the answer for those of you with large loads of stone to tumble. Its heavy-duty commercial tumblers are based on the original Highland Park design, which old timers will remember. There are five models with single, dual or triple barrel configurations. The Model 12T is a 12 pound-capacity unit with a 9-inch-diameter barrel and a heavy rubber barrel liner to keep it quiet. It sells for $463.

Diamond Pacific 12T



Diamond Pacific 24T



If you need a little more capacity, the Model 24T doubles the capacity to 24 pounds by using an additional 9-inch diameter barrel. It sells for $600

VIBRATORY TUMBLERS

Diamond Pacific has two neat little Mini-Sonic vibratory tumblers for beginners or for those of you who just want to polish an occasional small batch of stones. The KG 1 has a 2 2 pound capacity and sells for $98 50. The MT-4SV has a 4-pound capacity, a variable speed control, and a price tag of $169.50 For $20 less, you can have the same unit, but without the speed control.

Diamond Pacific KG-1

Diamond Pacific MT-4SV

Raytech is another old-line company with a variety of vibratory tumblers in its catalog. The Tumble-Vibe 5 is a great little tumbler for the hobbyist It will handle about 4 pounds of rock in its 8-inch diameter, 0.05 cu. ft. bowl.

Raytech Tumble-Vibe 5

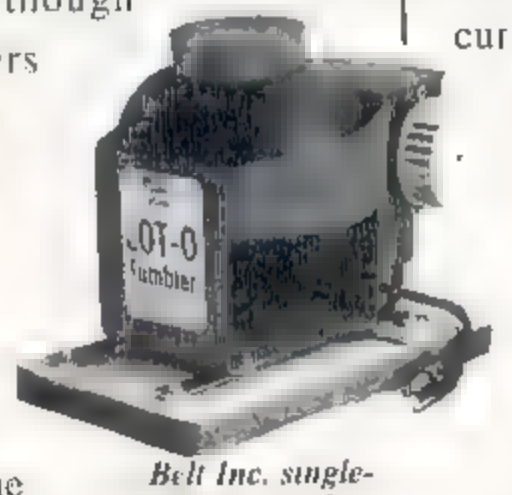
For $99.95 you can have a tumbler that will serve both the kids and the serious hobbyist, and will last for years. For $139.95, you can get the TV-5 Starter Kit, which includes the tumbler, a spare bowl, and a finish kit with all the abrasive grits necessary for rough grind to final polish.

Raytech TV-5 Starter Kit

If you would like to double the capacity to 0.10 cu. ft., you can step up to the TV 10 for $229.95.

Raytech TV-10

Belt Inc. produces the Lot-O-Tumbler. Although these tumblers have not been around as long as many others, they seem to be developing a loyal following. The manufacturer claims that agates will go from rough to a high luster polish in just five to seven days. The machine is available in a single-barrel model for $135 or a twin-barrel model for $199.50.

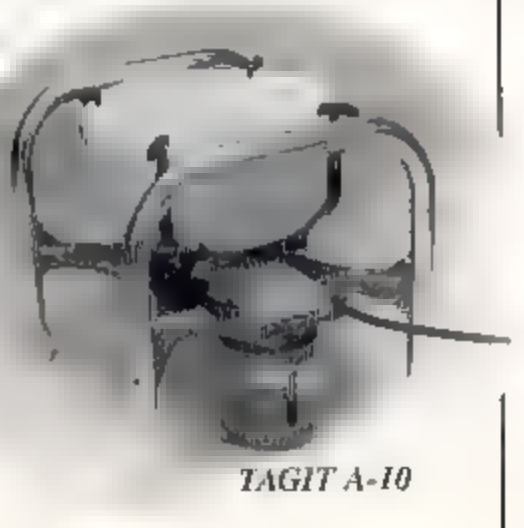


Belt Inc. single-barrel Lot-O-Tumbler

Tru Square UV-18 and UV-45

Tru Square Metal Products manufactures the Ultra-Sonic vibratory tumblers, models UV-18 and UV-45. The UV-18 has a load capacity of 18 pounds and sells for $300.51. The larger UV-45 has a load capacity of approximately 57 pounds and sells for $610.75.

TAGIT has been making the Gy-Roc Vibrahone tumblers for years. Models vary in load ranges from the B-2-5 (2.5 pounds) to the C-60 (60 pounds). The unique piggyback feature allows the use of two or three bowls on the same machine. The A-10 machine can also be used with an accessory flat lap, which fits on top of the bowl, to tumble stones and polish slabs at the same time. The lap becomes the cover for the bowl, and the bowl cover becomes a cover for the lap. The A-10 tumbler is priced at $345, and the lap accessory kit is an additional $60.

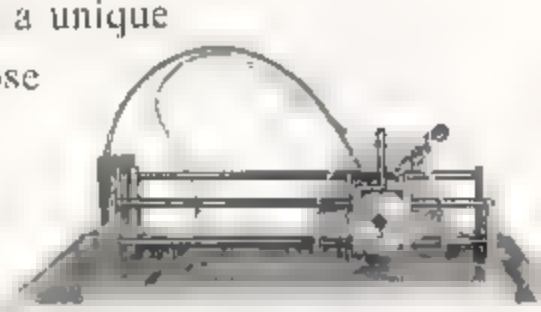


TAGIT A-10

TRIM SAWS

If you purchase slabs and just need to cut the preforms for cabs, you may be able to get by with just a trim saw. This will save money, but does limit what you can cut.

Taylor Manufacturing makes a unique trim saw that is perfect for those who like projects that require accurate cutting of thin strips, squares, triangles, hexagons, etc. It will allow you to make parallel repeat cuts, and even comes with a protractor to aid in making repeat angle cuts. The price is $498 without blade.



Taylor Mfg. trim saw

Lapcraft has been around since 1973 and has built up a reputation for quality products. Their L'il Trimmer trim saw will fit the bill for those of you who need a saw for trimming small slabs or cutting cab or faceting preforms. It is very compact, so it takes up very little space, and is all cast aluminum. It is available in a standard model with a 4 inch "Dia Laser" blade for $220, and a heavy-duty model with a ⅓ hp capacitor start motor and a 5 inch "Dia Laser" blade for $290.

Lapcraft L'il Trimmer

Johnson Bros. Tiny Trim

Johnson Bros. manufactures the "Rock Rascal" line of lapidary machines. Among these are the 4-inch Tiny Trim saw and the Model J and JM 6-inch trim saws. The Tiny Trim comes with a ⅓ hp direct-drive continuous-

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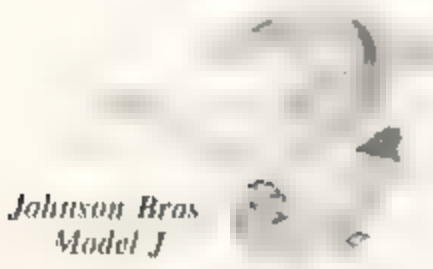
duty motor, which runs at 3,000 rpm. It is available for $206 without blade or $226 with a 4-inch Pro-Slicer blade.



Johnson Bros Model J

The Model J is available without motor or blade for $115. The Model JM is the same saw, but with a motor and blade. Just add coolant, plug it in, and start sawing. The price is $268.

The Graves Co. is another company that has been around a long time since 1946 to be exact. They are probably best known for faceting and cabbing machines, but they also make a very nice 4-inch faceter's trim saw. The saw comes with a sump, table, motor, a variable-speed foot control, and a splash shield. The unit is priced at $189 without blade.

Graves 4-inch trim saw

Lortone offers several trim saws. Among them are the TS8, the FS6 and the FS8. The TS8 is an economical choice for those of you who already have a motor. It is a 10 inch by 15 inch worktable with a heavy-duty 8-inch saw blade centered in the table. It comes with the splash shield, blade guard and arbor for $155. If you would like a more complete package, you should consider the FS6-C or the FS8-C. The only difference between these two is the size of the blade and the price. Both come complete with blade, vise, plastic hood, and a hp motor. The FS6-C, with a 6 inch blade, sells for $425. The FS8-C, with an 8 inch blade, sells for $475. Both saws are also available without blade and motor.

Lortone TS8

Lortone FS8-C

Raytech manufactures the Basic L-6S, a 6-inch trim saw that comes with a pop-up table, a lift-out sump, a ball bearing arbor, and arbor pulley for $224. The Jem Saw 45 is a more deluxe saw with a high torque, 3,000 rpm motor, a vise and a trim table, a stainless steel table, and a lift-out sump liner. The saw ships with a 5 inch by .012-inch by ⅝-inch Yellow Blazer Blade for $415.

Raytech Basic L-6S

Raytech Jem Saw 45

Diamond Pacific builds the TC 6 and the Wizard 6-inch trim saws. The TC-6 Model 1000 is a basic saw that comes without motor or blade and sells for $188. The Model 3000 includes a ½ hp, 1,800 rpm motor, a splash guard and a baseboard, but no blade, for $415. A slabbing vise is available for both models for $51.50.

Diamond Pacific TC-6 Model 1000

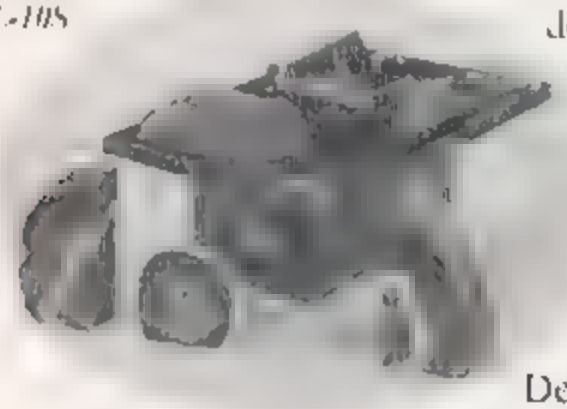
The Wizard is strictly a trim saw, and is not intended for slabbing. It would be ideal for someone traveling in a motorhome or for anyone with limited space for a shop. It has a built-in carrying handle and a unique coolant system, which uses water instead of messy oil, and is designed to be carried around without dumping the coolant. Without the blade, it is priced at $580. A rip fence attachment, to aid in cutting uniform strips, is available for $49.

SLAB/TRIM SAWS

If you collect your own rock or buy rough, a slab/trim saw is just what you need. These are a great compromise that will allow you to cut slabs from reasonably sized rocks, and then trim those slabs on the same saw.

Raytech offers two 10-inch saws in this category. The first is the Basic L-10S, which comes without a motor or

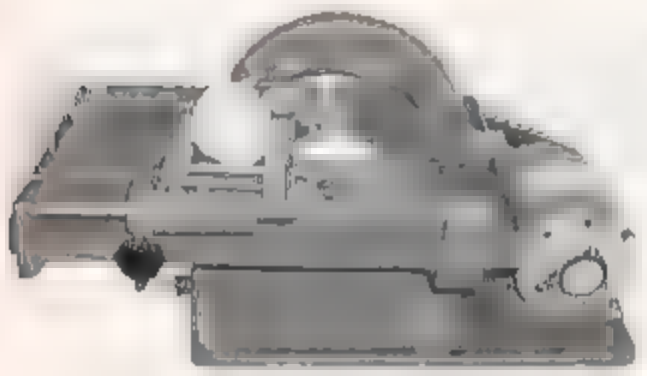
Raytech Basic L-10S



blade If you have a motor and don't mind buying a blade, this may be the way to go. If you would rather have the deluxe ready to go package, then the AL P10S Deluxe may be just right. It includes the basic saw, plus a power feed, hp motor, a motor base, a belt guard, a Plexiglas hood, a splash guard, and a 10 inch by 040 inch by -inch Green Blazer blade The price of the basic machine is $470, while the deluxe model is $1,100

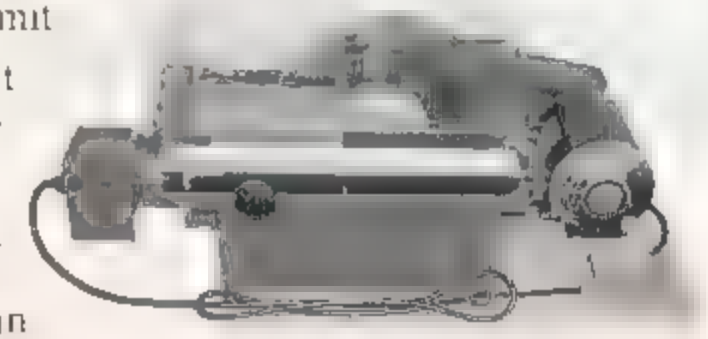
Raytech AL-P10S

Diamond Pacific makes two excellent 10 inch slab/trim saws. The model 10TS-B is built from the original Highland Park tooling. Highland Park was noted for its ragged machines for years This saw uses the time-tested gravity feed system on the vise. A small cable is attached to the vise, run over a pulley, and attached to a can filled with sand The weight of the sand pulls the rock through the blade You have to admit that there can't be a lot of maintenance on a bucket of sand You can own the 10TS-B for $961.



Diamond Pacific 10TS-B

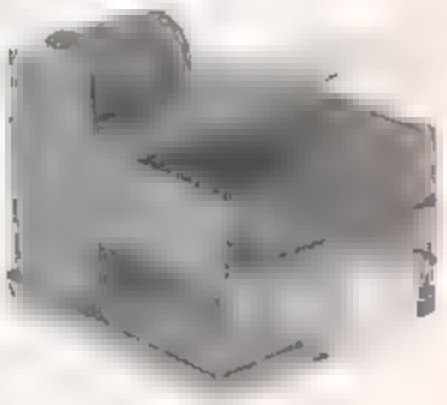
A little more expensive is the Model TC 10 Trim/Slab saw. This will slab rocks up to 3 inch by 6 inches by 6 inches The bucket of sand is replaced by a motor-driven power feed, and the vise slides on two stainless steel rails The TC-10 sells for $1,187



Diamond Pacific TC-10

without blade.

Lortone LS10C



Lortone produces several saws in this category. One is the LS.0C, a compact saw with a power feed and a detachable coolant tank. A hp motor is included in the price and is top mounted to save space. The price of $875 includes a 10-inch EXP Smooth Cut blade

Lortone LS14C

The LS14C uses a swing arm that lets the blade drop downward into the rock. This does away with the need for a power feed, since the weight of the arm provides a gravity feed. The vise is fixed, and the whole motor/blade/arm mechanism moves from side to side on a lead screw to adjust for slab sizes A recirculating pump sprays coolant on both sides of the blade. With its configuration and 14-inch blade, this is a little closer to a true slab saw than the LS10C, but it is still possible to trim preforms with it The price with a hp motor and 14-inch EXP Smooth Cut blade is $1,175

TAGIT 10-inch Gy Roc Preformer

TAGIT manufactures the 10-inch Gy Roc Preformer, another swing arm saw Unlike the Lortone, this saw is smaller and adjusts for slab thickness by a moving vise rather than a moving arm The machine is extremely well built and makes cutting preforms easy. Like most things that are a little different, some folks will like it and others won't If you are in the market for a slab/trim saw, though, I urge you to take a look at this one before you decide. One can be yours for $670

SLAB SAWS

Covington heavy-duty slab saws

If you collect lots of really big rocks, you might want to invest in a big slab saw On the other hand, if you don't have tons of them, it might be cheaper to have them cut commercially.

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Covington Engineering manufactures six different heavy duty slab saws: an 18-inch, a 20-inch, two 24-inches, a 30-inch and a 36 inch. All of them come with a quick-change six speed power feed system with an automatic shutoff, a bookend-type vise that tightens and loosens easily, a porthole window in the cover so that cutting progress can be monitored, and an MK Diamond 301 blade. Call or write for current prices.

Diamond Pacific makes some of the biggest rock saws around. These are very specialized machines and not what the average hobbyist would think of having. Still it is interesting to think about a 36-inch saw that could probably cut your Volkswagen in half. There are also 18-inch and 24-inch models. They are all beautifully built, precision machines and well worth looking at if you are in that market. The 36 inch model runs just a hair over $12,000, and a blade will set you back another $1,500 or so.

ARBORS

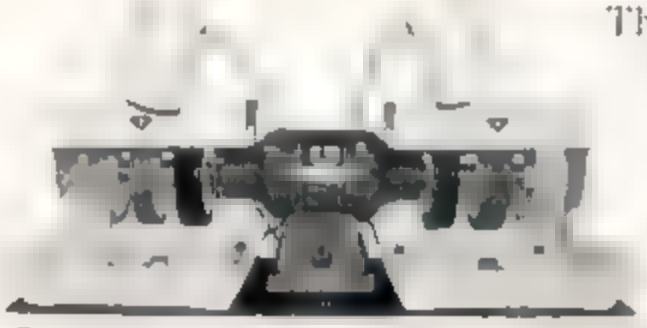
These machines are sometimes called arbors, sometimes cabbing machines and sometimes grinder/sander/polishers. Whatever you call them, if you are going to be making cabochons, you will need one. There are two basic types of machine. One uses wheels and the other uses discs. The wheel type machine usually has wheels with all of the grits needed for rough grinding through final polish on the same arbor, so there is no need to change wheels after each step. The disc machine normally requires you to change discs after each step, but it will grind flats much easier than the wheel type. Some wheel machines also allow you to use discs on the ends of the arbor, which gives you the best of both worlds. If you can, try out each type before you buy to see which one you like. Beautiful gems can be made on either machine.

Raytech Diamond Jem cabber

Raytech manufactures the Diamond Jem Cabbing Machine. This is a wheel-type machine built of heavy gauge aluminum with a stainless steel shaft. It comes complete with motor, lamp, a recirculating coolant system, two 6-inch diamond wheels, two diamond bands, and a spin disc on the end for alternative polishing. Just grab your preforms, plug it in, turn it on, and you're in the cabochon-making business. The unit sells for $1,549.

Diamond Pacific makes several wheel-type machines in this category. The Pixie is a compact, lightweight machine that uses 4 inch wheels, weighs less than 30 pounds, and measures only 14 inches by 18 inches. That makes it ideal for those with space problems or for snowbirds in RVs. It comes complete with all the wheels you will need to get started. Diamond discs can also be fitted to the end for making small flats. The Pixie sells for $1,025.

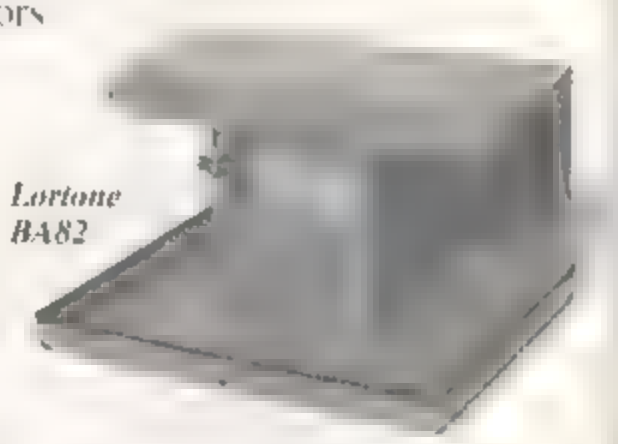
Diamond Pacific Pixie



Diamond Pacific Titan

If you need a heavy-duty machine, the Titan may fill the bill. This is a 6 wheel machine that uses 7 - inch wheels. In addition, you can add flat lap discs to the left end and regular diamond discs to the right. The Titan comes with all the wheels you need to get started for $2,640.

Lortone offers a line of arbors from basic units without motor or wheels to complete "turn-key" machines. If you are on a budget and would like to provide your own motor, wheels, etc., you might want to look at the BA82 (2-wheel) or the BA84 (4 wheel) arbors. The shaft is set up for 8 inch diamond or carbide wheels and expandable rubber drums. Flat discs can be fitted at either end. The BA62 and BA64 arbors are the same, but use 6 inch wheels. The BA82 sells for $185, while the BA84 is $220, the BA62 is $149, and the BA64 is $189.



Lortone BA82

Lortone BA84

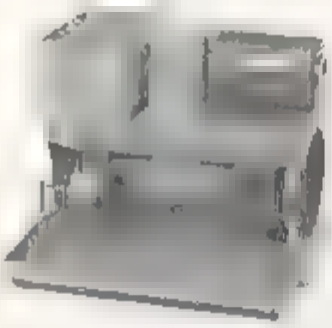
The GCD Diamond 6-inch Cabochon Arbor is a more complete system with 100 and 600 mesh diamond wheels and four resin bond belts of 600, 1200, 8000 and 14000

mesh. A polishing disc with 50000 mesh is fitted to the right end. The GCD is priced at $1,150.

Lortone GCD Diamond Cabochon Arbor

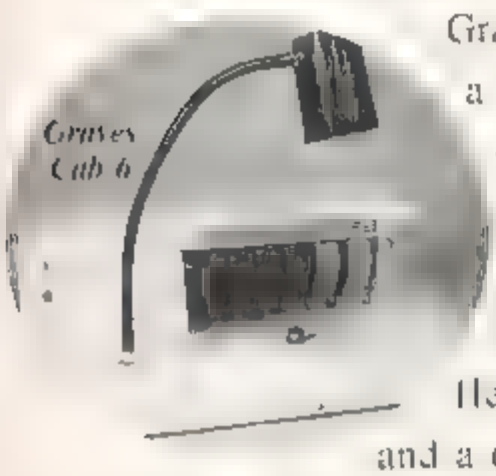
For those who would rather use carbide wheels than diamond, the Max Pro 8C could be just the ticket. It comes with an NS-8 arbor, an 8 inch silicon carbide grinding wheel, a sanding drum, a polishing head, and an accessories package. The motor is not included. Price for the Max Pro is $725.

Lortone Max Pro 8C



Graves' Cab 6 is a wheel machine that comes with a heavy-duty ½ hp motor, a flexible lamp, and a coolant spray unit. The shaft accepts six wheels, and the end will take diamond discs or polishing pads. The basic machine without wheels sells for $895. The unit with the diamond belt accessory package is $1,295. With the diamond Flex Wheel package, the price is $1,335.

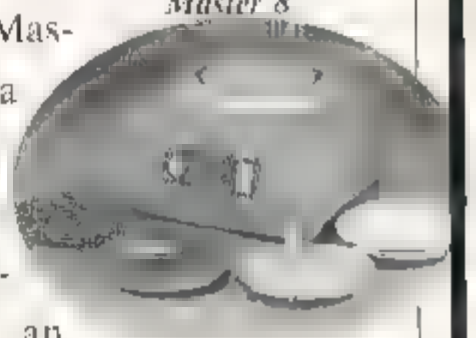
Graves Cab 6



Crystalite Ringleader

Crystalite produces both disc and wheel machines. The Ringleader uses both discs and wheels. It accommodates two 6-inch wheels on the arbor shaft and 6 inch Flexodiscs on the end of the shaft. The basic unit sells for $799. A Companion Kit with two diamond wheels (100 and 600 mesh), a lamp, splash guards, three 6-inch Flexodiscs, three 6-inch Crystalpads, a 2-gram diamond compound kit, and 2 ounces of Crystal Cut is an additional $449.

Crystalite Crystal Master 8



The Crystal Master units utilize a horizontal disc. There are three models available: a 6 inch, an 8-inch, and a 12 inch unit. The basic Crystal Master 8 comes with a ½ hp motor with a zero to 2,000 rpm speed control. The arbor will accept both discs and laps and sells for $675. The Companion Kit, with an 8-inch 180 mesh disc, three 8 inch master laps, an 8-inch 600 mesh lap, an 8-inch final polish Crystalpad, an 8-inch Polypad, a foam pad, 2 grams of 50,000 mesh diamond compound, 2 grams of 14,000 mesh diamond compound, and a 2 dram bottle of Crystalube is an additional $282.

Johnson Bros. manufactures two Rock Rascal arbor units. First is the 6-inch Model P arbor, which will hold up to six wheels. Without a motor or wheels, it sells for $128. When you add a motor and a base board, the price rises to $260.

Johnson Bros. 6-inch Model P

The JB Pro 6-inch Grinder will hold three wheels, and is drilled and tapped on the right end for ½-20 spin discs. A ½ hp motor and a 6 inch cast aluminum polishing disc that screws

JB Pro 6-inch Grinder

continued on next page

onto the right end of the shaft are included. The price without wheels is $510. Various kits in both carbide and diamond are available and range in price from $140 to $425.

COMBINATION MACHINES

Laperaft Stone Hog

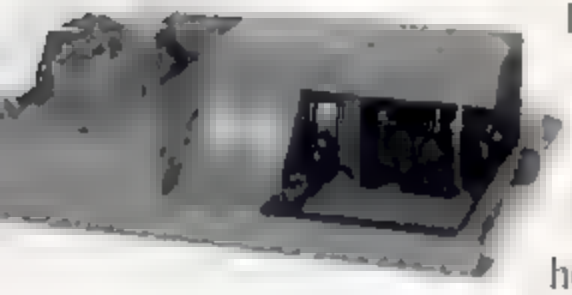
Several companies manufacture combination machines. These are arbors, either disc or wheel types, combined with a small trim saw. They are handy for those with space limitations, and will work fine for trimming, grinding, sanding and polishing cabs.

Laperaft's Stone Hog is advertised as a complete lapidary workshop, and it well may be. It is a compact machine that uses two diamond wheels and spin-on discs on the end of the arbor. It comes with a 6-inch by .012-inch Dia Laser blade and various polishing pads. The price for the whole works is $890.

Johnson Bros. TM 6

Johnson Bros.' Model TM 6 is a combination machine that comes complete with motor, a 6 inch Pro-Sheer blade, a 6 inch silicon carbide grinding wheel, a 6 inch aluminum head, a sponge rubber pad, a silicon carbide sanding disc, and a 6-inch felt polishing pad. The unit is mounted on a base and sells for $375.

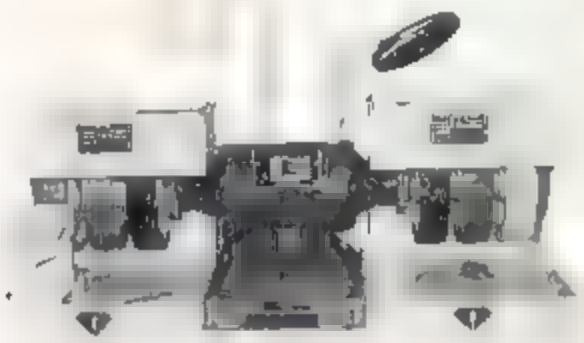
Lortone's contribution to the combination machine category is the LU6X-130. It comes with a 6-inch diamond blade, a silicon carbide grinding wheel, a sanding drum, a polishing head, a ½ hp motor, and an accessory package for $555.


Lortone LU 6X-130

Graves has come up with a very compact combination machine that is based on disks, although sanding with a drum is possible, too. Called the Cabmate, it comes in several configurations to fit the buyer's budget and desires.

Graves Cabmate

The basic unit includes a magnesium-aluminum alloy casting, a hardened steel double ball bearing arbor, a splash guard, an angled bezel grinding table, and the saw table. Also included are all the essential nuts, bolts and washers, an arbor pulley, and a quick disk. The price for this bare-bones unit is $125. An assembled unit, mounted on a wood base with a splash pan, drip tank, work lamp, and two-speed motor with belts and belt guard is $375. Adding a 6-inch by .012 inch diamond blade, a 100 grit silicon carbide wheel, 220 and 600 sanding discs, cerium oxide, dop sticks and wax raises the price to $475. Substituting diamond for the silicon carbide will increase the price to $635.


Diamond Pacific Genie

Diamond Pacific has a very nice combination machine called the Genie. Although it requires adding attachments in order to do all that it is capable of doing, it may be worth it to you to have access to such a wide range of functions in one machine. Not only will it grind and polish your gemstones, but it can also function as a trim saw, a lapidary buffer and a flat lap, and will miter perfect corners on such projects as gemstone boxes.

The basic Genie comes with everything you need to start making cabs except the preforms. Price for this basic unit is $1,525. The trim saw attachment comes with a molded plastic pan and hood, an 8 inch by .032-inch diamond blade, a shaft adapter, an angle block, a sample bottle of Water Aid, and a pair of safety glasses for $235.

VIBRATING FLAT LAPS

Raytech Hustler 15

The flat lap is a rather specialized machine, but if you intend to polish a lot of slabs, geode halves, clock faces, etc., it is the only way to go.

Raytech's flat lap is designated the Hustler 15 Deluxe. Standard with this 15-inch unit are two grooved pans, bumper rings, a polish pad, and a grit kit, which contains all the abrasives and polishes needed for a fine finish. Raytech maintains that a smoothly sawed slab can be brought to final polish in three to seven days. Price is $555.

Diamond Pacific offers two models of flat laps: the 18-inch double-deck DL-18, and the 20-inch and 27-inch Vi-

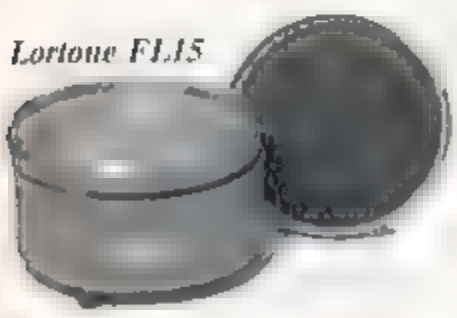
Diamond Pacific DL-18

Bro Lap models 20VL and 27VL. The DL-18 can do the rough stages of lapping on the lower pan and the polishing stage on the top, simultaneously, for a real time saver. The DL-18 sells for $795.

Diamond Pacific 27VL

The 20VL and 27VL models use a unique double-action grinding and polishing process. As the plate oscillates, the work piece rotates. This gives faster grinding speed, distributes the abrasives better, assures a flat surface, and equalizes wear on the lap plate. Both models come with a welded steel frame, a ⅓ hp motor, a medium lap plate, a polish pad, and a galvanized circle. The 20VL sells for $1,285 and the 27VL sells for $1,485.

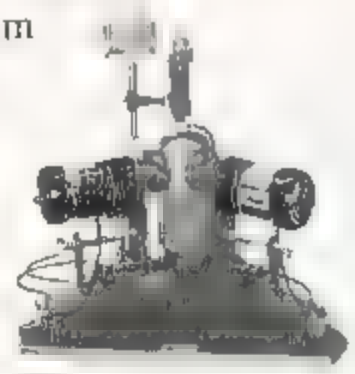
Lortone FL15



Lortone makes two vibrating flat laps. They feature heavy steel frame construction and come with separate grinding and polishing pans. The 15-inch Model FL15 sells for $460, while the larger Model FL20 sells for $620.

SPHERE-MAKING MACHINES

Covington Engineering has recently finished three years of design and testing on its new Model 383 three-head sphere-making machine. With this machine, you will be able to make spheres from 2 inches to over 10 inches in diameter. The motors are ⅓ hp gear motors, and are available in either 110v or 220v configurations. Each motor is mounted on a swivel base to allow the cutter cups to move more freely. Left- and right-hand springs provide adjustments to help the sphere rotate in all directions. Five different cutter cup sizes are available. Call or write for current prices.



Covington Model 383

RRR three-head sphere machine

Richardson's Recreational Ranch in Oregon produces a three-head sphere machine that also uses gear reduction motors. The cups are standard plumbing items, which are easy to find at any hardware store or home center. Call or write for information and current price.

Diamond Pacific has made some changes in its two-head sphere machine and now calls it the Sphere Engineer. It claims that this machine will produce a more perfectly round sphere (a trait of the two-head machine) and also has the most desired feature of the three-head machine —continuous oscillation. The Engineer comes with two power heads that each contain a ⅓ hp two-speed (1,725/1,050 rpm) motor with

Diamond Pacific Sphere Engineer

continued on next page

a double reduction drive. The slower speed is for grinding, while the faster one is for polishing. The machine is made of heavy duty welded steel and sells for $1,600.

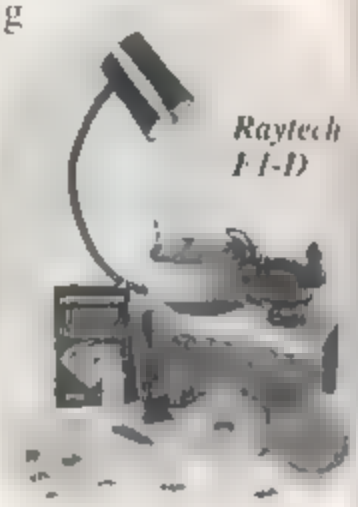
FACETING MACHINES

There are many faceting machines on the market, and they use a number of different means of doing the job. Some use a "hard stop" and some use a "soft stop." Some use dial indicators and some use a fine needle that must be lined up. Some use neither. It is important to note that these machines can be expensive. They run from just under $1,000 to over $4,000, without the diamond laps. Don't let price alone be the determining factor in your purchase, though. To paraphrase something I saw on the Internet, it is the person doing the faceting and not the machine that determines how well the stone will turn out.

Graves has been making faceting machines since 1946 and currently produces the Mark I and Mark IV units. The machines are identical with the exception of the motor. The Mark I has a heavy duty two-speed (214 and 324 rpm) motor suited for continuous production use, while the Mark IV uses a smaller variable-speed motor best suited for lighter duty use. The Mark I sells for $1,195, complete with an accessory kit containing all the laps. The Mark IV, with the same accessory kit, sells for $1,095.

Raytech manufactures the Raytech-Shaw faceter in a basic model (F1-B) and a deluxe model (F1-D). The big difference between the Raytech Shaw and other machines is the absence of a mast. Most machines mount the hand piece, which holds the stone, to a vertical mast. With this configuration, the stone is inspected during finishing by swinging the hand piece upward. It can be a little difficult to observe the stone at all angles, since the hand piece is fastened to the mast.

Raytech F1-B



Raytech F1-D

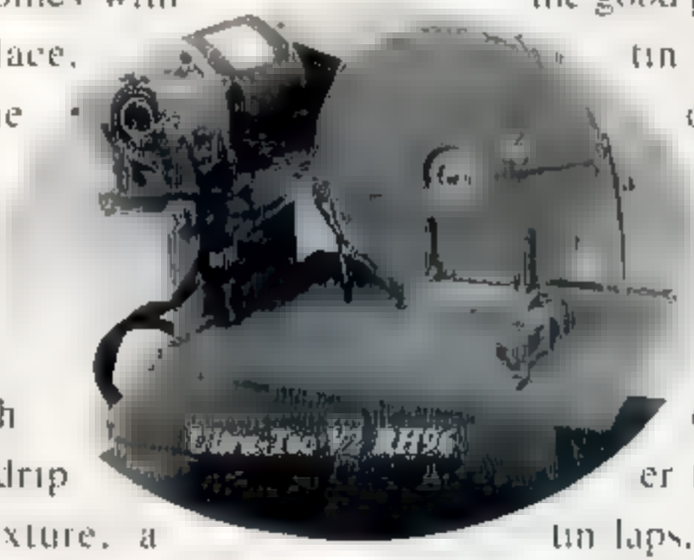
On the Raytech-Shaw, the hand piece sits on a platform and can be lifted off, and the stone can be observed from any angle. These machines also have a patented indexing system that clicks into position to avoid setting incorrect angles. The F1-B sells for $1,369 without laps. The F1-D is $1,599 with a set of laps and other extras.

The Jarvi Tool Co., which manufactures the Facetron faceter and the computer-controlled Facetron faceter, has come up with a new, modernized version of the jamb peg faceter called the jp-Facetron. For under $600 (not including the laps, of course), you can get into faceting. If you have been

Jarvi jpFacetron

thinking of faceting, but have been put off by the price of machines, or if you are an experienced faceter who would like to speed up preforming, this one is really worth looking into.

Ultra Tec is a name that will be familiar to anyone who has thought about faceting. This company makes an extremely high-quality machine, which is thoroughly tested before delivery and even comes with the test piece in place. Couple this with the lifetime warranty, and you may have exactly what you need. The Ultra Tec V2 RH96 comes with a 96 index gear, a drip tank, a transfer fixture, a tabling adapter, 12 dops, wrenches, a drain hose, and both printed and video owner's manuals. The price without laps is $2,850.



Jon Rolfe, known to faceters and Web browsers as "Gear loose," is offering a polishing lap he calls the BATT Lap. It is made of a tin alloy developed by Rolfe, and he claims that it has all the good points of the old tin laps with none of the bad ones. Furthermore, it contains no toxic lead or cadmium. Because it is harder than traditional tin laps, it will provide sharper meets and will last longer.

Other benefits include two-sided construction, which doubles the lap's usefulness, and hardness, which eliminates the "orange peel" that develops on tin laps after use. The laps are a solid casting, which allows for resurfacing many times, a feature that drops the cost considerably over the life of the lap. The recommended price for the 6 inch BATT Lap is $69, and the 8 inch model is $89. Be sure to visit Rolfe's Web site, www.gearloose.com, for complete information on the lap and for a fascinating look at some beautiful home-made faceting machines.

Special Displays for Special Pieces

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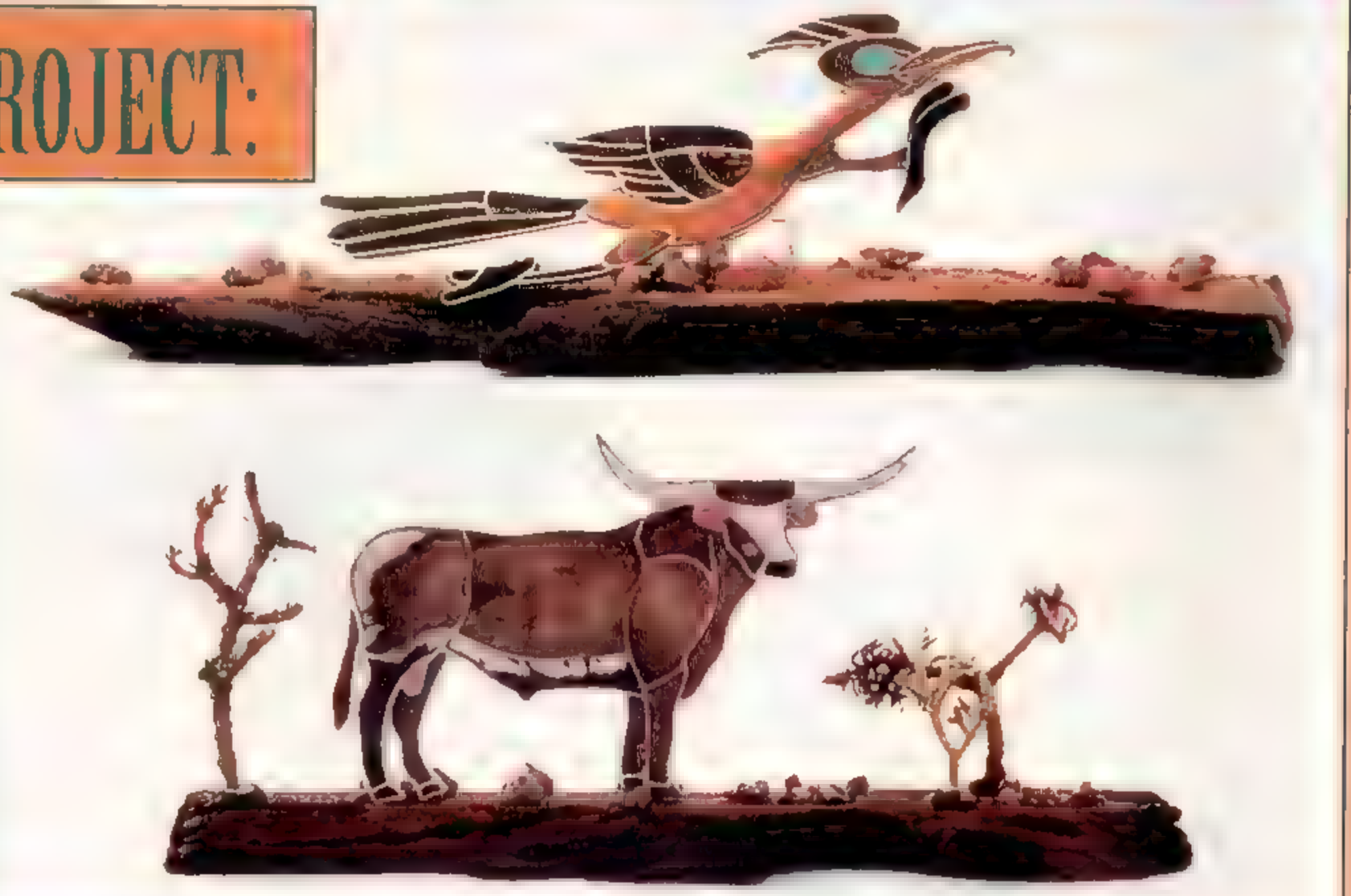


These display bases are an attractive way to display your jewelry pieces when they are not being worn. (Photos by the author)

A New Way to Show Off Your Jewelry Projects

by Max A. Hatch

Isn't it a shame that when you are not wearing your beautiful, hand-made jewelry, you keep it tucked

away in some dark drawer, out of sight? Recently, while making display bases for some of my stand-alone inlay figures, which are made strictly for display, I realized that my wife had several pieces of jewelry that could be displayed in the same manner. We could make one piece of jewelry do double duty and be shown in two different ways!

In this article, I will discuss a couple of basic methods of displaying these items. There are several other examples that have come to my mind, however, that I intend to utilize for different types of pieces. There are probably several other effective ways to display jewelry items, depending on what they are. Surprisingly, very little in the way of materials is needed for these display stands.

continued on next page

Special Displays for Special Pieces *from page 41*

Many people have beautiful horse ties showing intricate inlay work or constructed silver work. Instead of having these in a drawer or on a hanger somewhere in a closet, use the method that I use to display many of my inlay figures, which I described in a previous article ("Make an Inlay Objet d'Art" February 2002 *Rock & Gem*, page 48). It involves attaching a silver tube to the back of the piece, inserting a length of wire through it and bending the wire into legs, which are inserted into holes drilled into an ironwood or other base.

Normally you would epoxy the tube to the back of the figure to be mounted, but if the piece is something you will want to remove from the base and wear, use a piece of double-sided carpet tape to hold the tube in place.

Another type of mounting can easily be made using small pieces of acrylic sheet, preferably about ¼ inch thick. When making a stand from plastic, you must do a bit more planning. You will need to cut two pieces of plastic to form a stand and, usually, another piece shaped to fit a feature on the bottom of the item to be displayed.

I formed this stand for two of my jewelry pieces, a blue horse pendant and a hummingbird pin. First, I laid the pieces on the plastic sheet with the hummingbird's pin mountings and the horse's chain loops resting on the edge. I traced the lower outline of the pieces onto the plastic with a sharp scribe. The backing piece is designed to blend in with the outline of the pendant.

Since suspending the horse pendant by its chain loops would not keep it level, it was necessary to provide some extra support. The pendant has a fairly small and irregular opening bounded by the belly and front and rear legs. I marked the shape and position of this opening on the outline before tracing it onto the plastic sheet separately.

The third piece is just a rectangle with one side the same length as the base of the upright piece.

I used the jeweler's saw frame and blades to cut these pieces from the sheet. Using a flat file, I made a slight bevel on the front edge of the bottom piece and on the bottom of the front piece. This allows the front piece to tilt backward just a bit, and allows for better balance of the display piece and a better angle from which to view it.

I placed a thin coating of super glue on the back of the small support piece, then set it in place on the pre-marked spot on the outline piece. This piece must be placed exactly, as it cannot be moved once contact is made. The super glue makes an invisible bond between the two pieces. Next, I coated the front, tapered edge of the base piece with the super glue

continued on page 44

A Dremel tool with a small router bit was used to create a flat space for mounting in this ironwood base, and a hole was drilled for securing the acrylic base with a screw.

Special Displays for Special Pieces *from page 42*

and set the upright piece in place. It is usually best to brace the base piece against something solid while setting the upright piece in place.

If there is no level spot on the base on which to set the acrylic stand, you can use a Dremel tool with a small router bit to create one. To set the plastic stand on the iron wood base, I drilled two small holes through the base piece of the plastic stand and two matching pilot holes in the wooden base, and used small screws to hold the two together. I chose to decorate the base, but it could be left plain or even polished.

At normal viewing angles, neither the two screws holding the acrylic base to the wood nor the support piece under the horse's belly are visible.

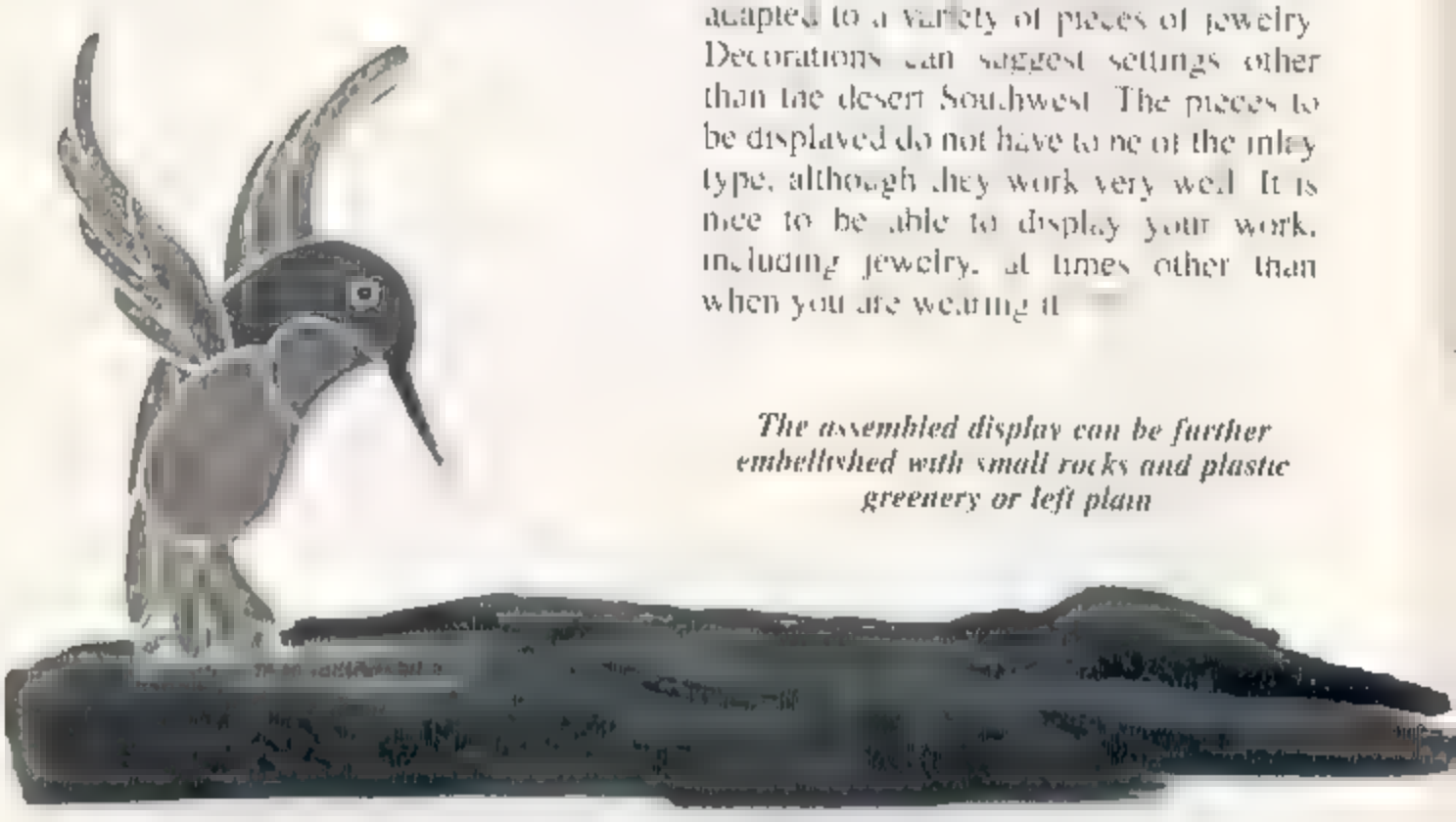
In the case of the hummingbird pendant, the bottom of the pin assembly rests on the top of the upright piece of plastic and no other support was required. The upright piece was shaped to follow the curves of the bird and is hardly noticeable. I anticipate making another piece to complement this pin, so I left the wooden base unadorned.

A roadrunner piece sits on an acrylic stand fashioned with a support piece, similar to the one I made for the horse pendant. Since it is meant to be a more or less permanent mounting, a piece of double sided carpet tape is used to secure the roadrunner to the base. The ironwood base of this piece is embellished with scenery to suggest the Southwest desert, where this bird thrives.

The most elaborate display of this type that I have seen began as one of my Hereford bulls on a base of ironwood. It was nicely adorned with appropriate greenery to suggest the rugged conditions cattle must endure here in the Southwest. The owner seemed to appreciate the piece and all was well. Some time later, however, I saw the piece again and was astounded at some of the changes!

The entire piece had been mounted on another inch-thick piece of wood, which formed the bottom of a box. The front of the box had been cut out and replaced with an acrylic sheet, which made a window. The inner sides and back of the box were covered with a computer-generated mountain scene to form a distant background. To top it all off, a small flashlight lamp had been installed, along with battery, on the inside of the box. The light is controlled by a hidden switch, built into the outside of the box! The owner said he just had to do something so that he could transport the piece around and show it off without shattering breaking all the scrubbery!

These types of display stands can be adapted to a variety of pieces of jewelry. Decorations can suggest settings other than the desert Southwest. The pieces to be displayed do not have to be of the inlay type, although they work very well. It is nice to be able to display your work, including jewelry, at times other than when you are wearing it.



The assembled display can be further embellished with small rocks and plastic greenery or left plain.

THE RED GEM CUPRITE

A 70 carat cuprite gem, cut by Buzz Gray, on a background of malachite. (Jeff Kurtzman photo)

This Simple Copper Oxide Has a Complex Crystal Form

by Bob Jones

If you check the older books on mineralogy, you'll find cuprite listed as cuprous oxide with a chemical formula of two copper atoms and one oxygen atom. More recent texts offer a different formula, half a copper atom with one oxygen atom ($Cu_2^{+1}O$). Obviously, there are no half atoms which means cuprite atoms form in molecules of even numbers.

Cuprite crystals form in the cubic, or isometric, system, so you will see them as cubes, octahedrons, dodecahedrons and even more complex crystals. Almost all cubes are modified somewhat with missing corners, forming cubo-octahedrons, or flattened cube edges, the beginnings of a dodecahedron form. None of these forms of cuprite are my favorite. I like what the early natters called "plush ore," "tile ore" and some local names we probably will never see in print. Cuprite can form fuzzy, hairlike, acicular needles that can be matted or tangled, or can even form geometric patterns. We call this variety of cuprite chalcotrichite and its color almost always ranges from brilliant red to brick red to almost black. Another rare example I like to see is chalcotrichite included in other minerals, mainly calcite. When chalcotrichite is seen in perfectly laid out geometric patterns, almost always in squares, it is called "tile ore" or "brick ore." I believe that the habit of forming of hairlike crystals parallel to each other to create a crystal pattern is unique to cuprite. The only other mineral I can think of that forms acicular crystals in a recognizable geometric pattern is rutile.

Cuprite is a common ore of copper. It can be massive and found in thick layers or zones that can be mined. It can also be mixed intimately with other minerals to form a very rich ore. Cuprite runs as high as 70 percent copper.

If cuprite is so common, why don't you see a lot of specimens in the market? The main reason is because the working copper mines have dug down through the oxide zones where cuprite normally forms. It has been mined out of virtually all American copper mines, as well as the classic mines of Cornwall and the ancient mines of Russia. Cuprite occurred at historically important Cyprus or at other mines worked in very ancient times, none of it survived as specimens as far as I know. The huge open-pit copper mine at Chuquicamata, Chile, contains little oxide ore. Instead the weathered ore tends to be sulfates and other unusual copper compounds.

The last really important production of cuprite crystals for collectors has come from Africa, first from Tsumeb, which is now closed to mining, and more recently from the Central African copper belt, mainly in Zaire (formerly the Belgian Congo). Superb cuprites have recently come from mines in areas that were worked by local peoples long before Europeans ever reached Africa.

Cuprite is one of the secondary oxides

produced by weathering on what might be relatively low-grade copper ores. Such action releases copper ions which, when combined with oxygen, form this rich red ore. Its occurrence in any deposit is largely determined by the depth of the oxide zone.

Because of its simple chemical combination and high metallic content, cuprite has made it possible to operate otherwise low-grade deposits at a profit, which allowed for the development of the low grade ores into a profitable mining operation. This red metallic ore has a high specific gravity. It also tarnishes very quickly on any broken surface. Its Mohs hardness is 4.5, so it is not suited for gems to be worn in jewelry. That's too bad, because cuprite's vibrant red color is stunning.

For collectors of cut gem oddities, cuprite is an ideal subject because it takes a wonderful polish and has great eye appeal. Cuprite's color is due to the unusual arrangement of its electron layers. It acts like a metal element in the way it reacts to light energy to create the resulting color. Its electrons are arranged in such a way that there is a submicroscopic gap between the layers of electrons. As light energy enters the cuprite molecules, much of it is absorbed and consumed by these electrons, which shift their position, jumping the gap within the electron structure. The red wavelengths of light are not absorbed, so they dominate the visible light that is reflected from the transparent crystal.

As cuprite is exposed to light, it tends to darken. It also tarnishes easily, as already mentioned. The tarnish shows up as a metallic rainbow colored glisten or shine on the surface of crystal faces.

Some of the most spectacular specimens of cuprite that have survived are those that were mined at the Onganja Mine, near Seeis, Namibia. During mining operations in early 1974, a seam was opened in which cuprite crystals jutted from the surface of a crystallized calcite layer. And what cuprites they were! The largest crystal reported is 4 inches across! Many of the crystals are 2 inches across. All are modified octahedrons, and all of them are coated with a lovely soft green alteration layer of malachite. Under that malachite layer, which is about 1 millimeter thick, is some of the gemmiest cuprite ever found.

It seems a shame to consider faceting these red gem crystals and, luckily, not many of the perfect ones were so abused. But any crystal with a chipped or broken face immediately hit the saw and lap, and the resulting faceted red gems are a marvel to behold.

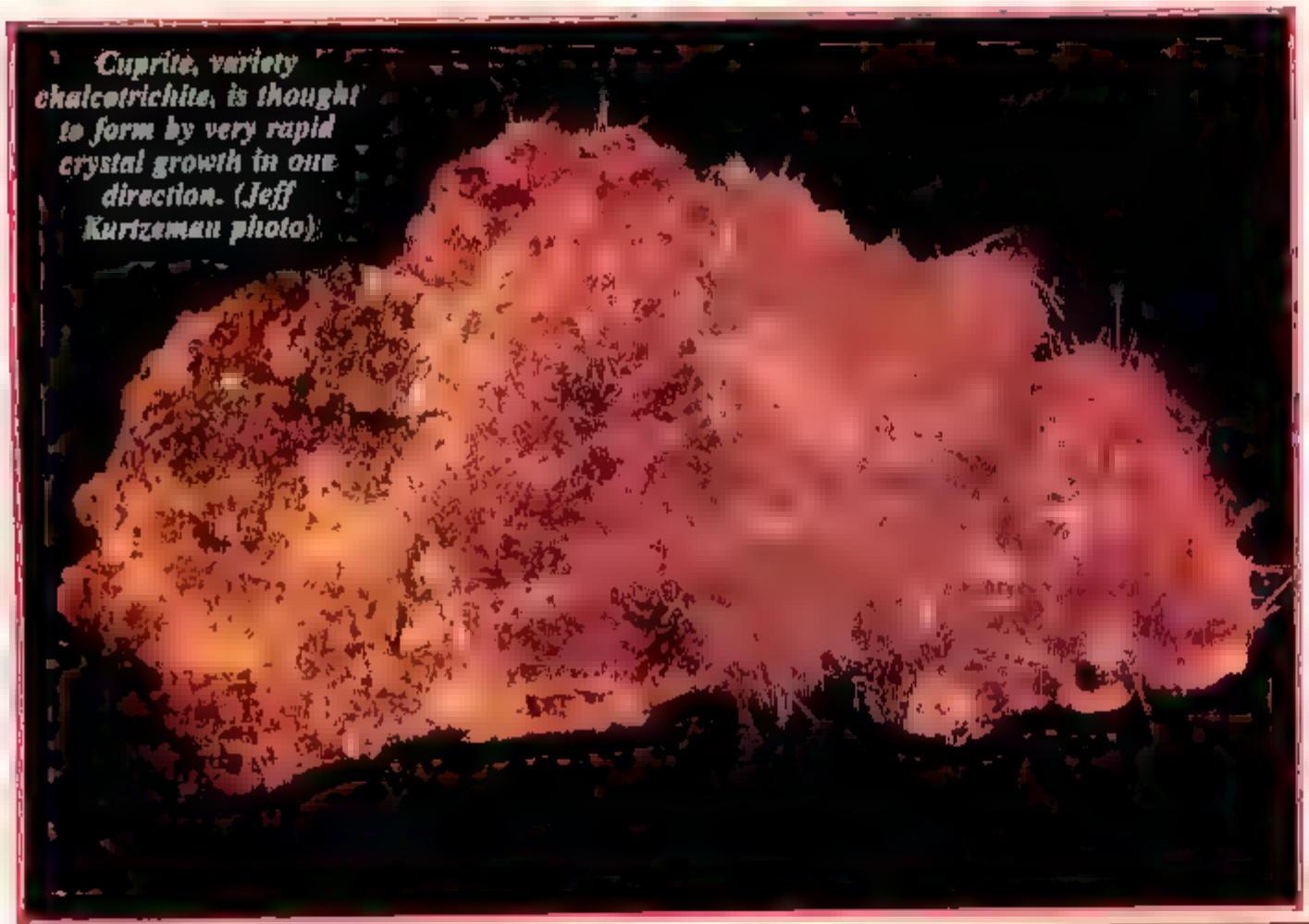
continued on next page

A cuprite on copper specimen from the Pearl Handle Pit at Ray, Arizona, now in the Evan Jones Collection. (Jeff Kurtzeman photo)

A choice dodecahedral cuprite crystal on cuprite ore, from the Harvard Collection. (Bob Jones photo)

A fine gem cuprite crystal, coated with malachite, from the Emke Mine in Onganja, Namibia. (Bob Jones photo)

Sharp octahedrons of cuprite from Bisbee, Arizona, now in the Harvard Collection. (Bob Jones photo)



Cuprite, variety chalcotrichite, is thought to form by very rapid crystal growth in one direction. (Jeff Kurtzeman photo)

Crystals on matrix – and there were a limited number – were carefully preserved. A very few of the modified octahedrons showed an elongate habit, taking on a rather tabular appearance. Today, an occasional Oganja Mine cuprite specimen surfaces from a collection, but these are immediately snapped up by knowing collectors.

The classic American cuprite locality has to be Bisbee, Arizona. Superb cuprite cubes, wonderful modified cubes, cubo-octahedrons, and dodecahedrons were encountered through most of the early decades of Bisbee's mining as the deep oxide zone was worked. Yet, the finest crystal ever found and preserved is one found by a collector after the mine shut down. It is a remarkable, gem-clear, bright, elongate cube that measures nearly 2 inches on its longest edge. Perched on matrix and associated with some uncommon copper species, it is considered by most the finest cuprite specimen ever to survive the ravages of mining at Bisbee.

Like most copper mines, especially those in the desert, Bisbee enjoyed a very deep oxide zone, extending over 1,000 feet into the earth in some places. It is in this oxide zone that Bisbee's richest cuprite deposits were found, and those deposits held vugs and seams containing large quantities of superb cuprites. Some were the finest bright red. Many were darker red, and some were even black due to included material.

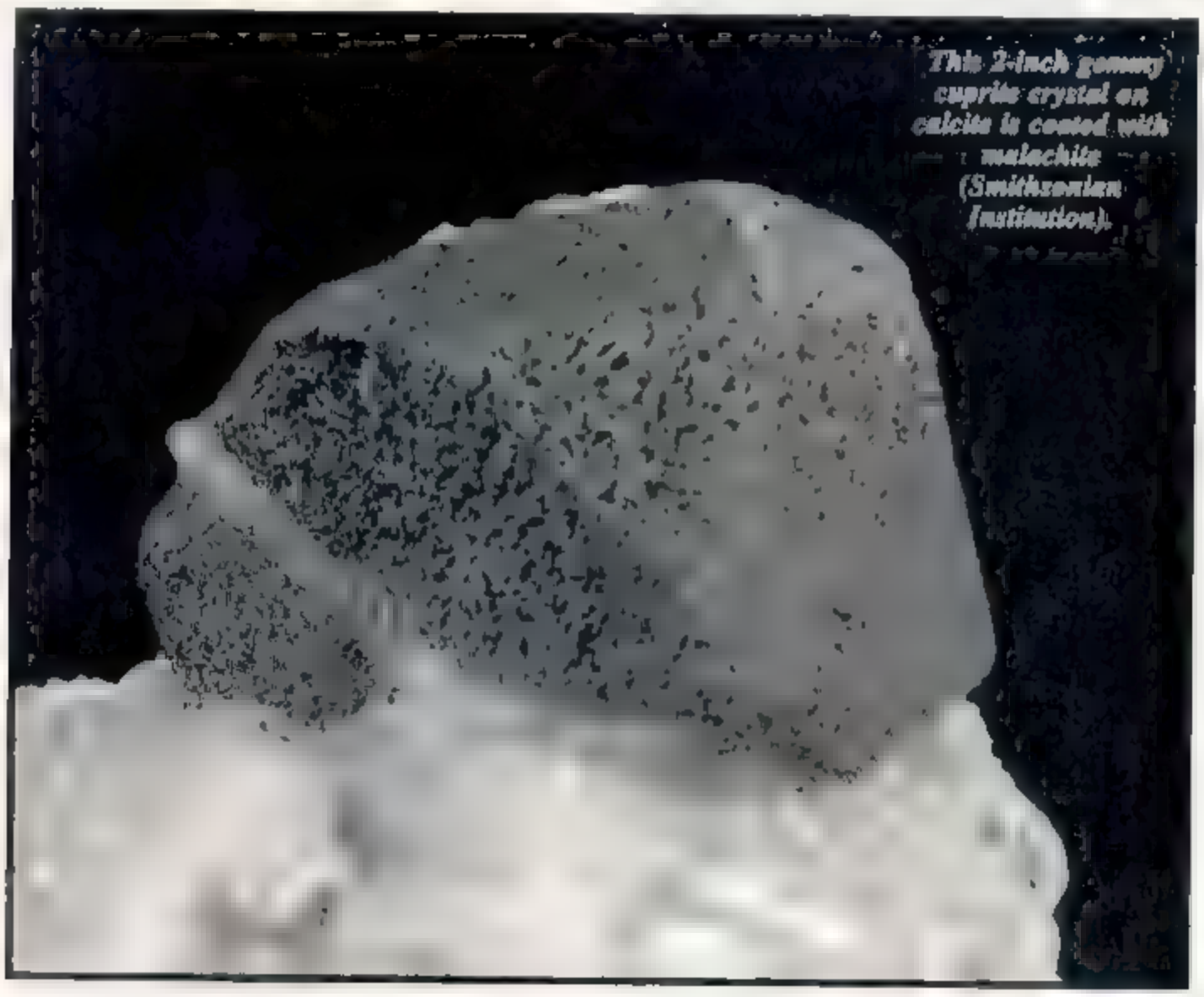
The exciting thing about Bisbee's oxide zone was that it was so rich that it could be mined at a profit regardless of the cost of mining and transport. The earliest mine to open was the Copper Queen. Started as a small open cast effort, it quickly became an incline into the ore body. The mine was managed by Ben Williams, whose brother eventually built the first smelter in Bisbee. Before that, ore from the Copper Queen Mine was hauled by mule train to the Gulf of California, loaded aboard sailing vessels, shipped around Cape Horn to Swansea, Wales, and smelted at a profit. Imagine how the profit margin shot up when the smelter at Bisbee came on line!

There are a host of interesting stories connected with the early days of the Copper Queen Mine. There was the day when the early mining efforts ran out of ore. The decision was made to close down this budding venture for lack of money. Such a move would have been disastrous and delayed development of the deposit. But Williams made a fortuitous decision. He ignored the shut down order and tried one more dynamite blast. Miracle of miracles, that blast penetrated a huge, very rich oxide zone that saved the project. The rest is mining history, as Bisbee eventually became the richest copper mine in Arizona.

Not all the Bisbee cuprite was massive ore or crystallized in open spaces. Some of it was that delightful, plush tile or brick chalcotrichite – hairlike clusters and masses of bright red. Very rarely, but fortunately, this hairy red material was later engulfed by calcium carbonate. Since the ore deposit was largely enclosed in limestone, later surface waters and groundwater dissolved the limestone and usually re-deposited it as calcite crystals. If hairy red chalcotrichite happened to be in the path of these carbonate rich waters, the new calcite crystals can be a delightful red, thanks to the included cuprite. Hairy malachite has also been found at Bisbee, but is even more rare than the chalcotrichite in calcite specimens.

Now that Bisbee has closed down, save for some leaching programs that are ongoing, cuprite and other very desirable copper minerals are no longer available. Luckily, another famous Arizona copper mine is still working. The copper deposits at Morenci in extreme eastern Arizona were some of the earliest deposits explored and mined. Today, the mine is largely a big pit operation in the typical low grade copper porphyry where few if any, decent copper mineral specimens ever come to light. But whenever the pit is enlarged, the remaining upper oxide zone along the perimeter of the pit is breached, and for a brief time fine specimens may come to light. Fine azurites have been found, some of them as tiny brilliant blue crystals covering stalactites of malachite, goethite or chrysocolla. The oxide zone also yielded a few specimens of chalcotrichite and even a few bright cuprites. Mine operators, recognizing the value of oxide minerals, allowed specimen mining to occur and even set aside some piles of oxide ore for club field trips, arranged on a formal basis.

Yet another Arizona mine, the Pearl Handle Pit at Ray near Hayden, has yielded another form of cuprite. When the Pearl Handle Pit was opened in the early 1950s, a thick layer of arborescent copper crystals was unearthed. These huge masses of the red metal, well crystallized and in long branching specimens, were abundant for a short period of time. What made this occurrence unusual was that these lovely arborescent coppers had a coating of brilliant, dark red cuprite crystals that had developed and oriented along the axes of copper. These were so abundant that miners



This 2-inch gemmy cuprite crystal on calcite is coated with malachite (Smithsonian Institution).

could hardly gather them all Most went to the smelter but enough of them survived so that even today you can find small specimens of bright cuprite on native copper

Some years ago, I had to appraise the collection of Fred Jones (no relation), undertaker for the city of Globe, Arizona Fred had passed away shortly after World War II, but his delightful wife, Sammy, had maintained her interest in the collection and welcomed visitors to see this excellent and very large collection

Being familiar with the Sammy Jones Collection through my frequent visits, I was asked to appraise the collection It held many absolutely wonderful species, but the thing that struck me most was a single glass department store display case full of specimens of cuprite on native copper from that Pearl Handle Pit discovery That case was 6 feet long and had two shelves in it. The shelves and the entire floor of the case were covered — in some cases two and three specimens deep — with fine cuprite on copper!

Cuprite crystals also occurred at Ray, but not in great quantity. I remember one specimen that used to rest on the desk of the geology professor at Arizona State University It was a chunk of rock about 8 inches across, and sitting atop that rock were several perfect cuprite cubes that measured an inch on an edge In later years, I mentioned this specimen to my son Evan, who was the collection manager at ASU while a student there The specimen was no longer there!

For the lapidary, the Ray pit did produce some choice cutting rock, a solid mix of bright-blue chrysocolla, red chalcotrichite, and green malachite Almost all this seam material was collected by John Mediz of Globe, who had the collecting contract at Ray when its material surfaced John recognized the value of this colorful rough, and he cut and polished nearly all of it for sale

John was also responsible for collecting the last occurrence of fine cuprites at Ray Luckily, he gave me a call, and I dashed up to his place I was delighted to see a large assortment of dark red brilliant cubes and cubo octahedral cuprite crystals Most of them ranged from microscopic to 1 inch on an edge However, I was fortunate to select one large rock, which was later trimmed to reveal a superb 3-inch modified octahedron skirted by tiny, bright cuprite crystals

Neighboring New Mexico has one copper mine that produced cuprite on copper very much like the material from Ray, some fine cubes, sometimes slightly rounded, but sharp, have also come from the Chino Pit at Santa Rita The cuprite on copper is bright and easily mistaken for Ray material, though the quantity of material from the Chino Pit never reached the level of the Pearl Handle Pit

Today, a collector's best bet for a good cuprite specimen would be to obtain one mined in Africa That huge continent has been host to several cuprite sources We've already described Ongania's stunning cuprite gems The other sources are Tsumeb and the Zaire deposits, whose mines are concentrated in what is now known as the Shaba Crescent

Tsumeb has been the source of so many fantastic species and specimens that cuprite has been shunted aside as just another good mineral Granted, Tsumeb has produced few spectacular cuprites compared to its other species or other cuprite localities Yet, sharp red crystals mostly octahedral or modified octahedrons, have come from this prolific mine in some abundance Most are on solid cuprite ore, an ore that contributed its measure of wealth to Tsumeb's glorious history With luck we may still see some good Tsumeb specimens, including cuprite Contract specimen mining is now a reality there, and we can only hope it will be successful.

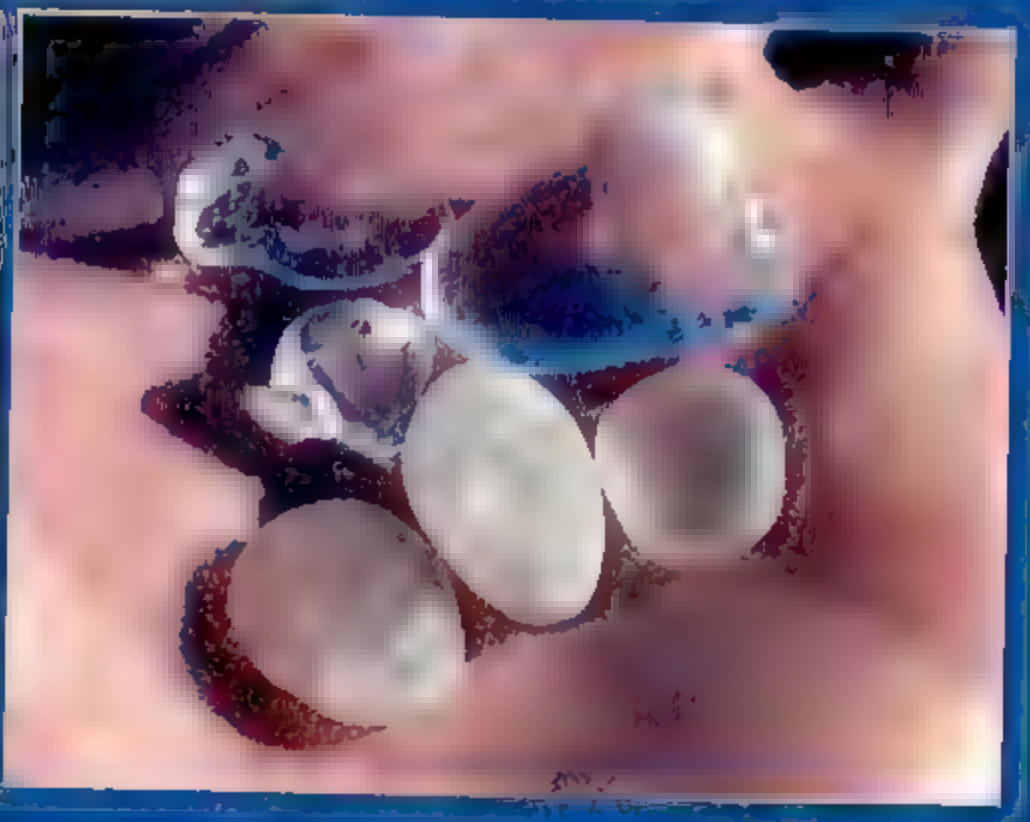
The Shaba Crescent mines of Lakast, Kolwest, Dikuluwe and Mashamba West are most likely to produce collector cuprite specimens In the fall of 1988, some superb red cuprites from the Mashamba West Mine appeared on the market They were offered for sale by my good friend Gilbert Gauthier, who spent more than 25 years as a mining engineer in that region The Mashamba West specimens were perfect brilliant-red octahedrons in small clusters of a few inches across Many were in a parallel position on the matrix What made these really attractive was that there were two forms, or generations, of cuprite on most specimens The earlier ones were covered with a light coating of pale-blue chrysocolla Sitting atop this coating were the bright-red cuprites that formed later

These spectacular cuprite and chrysocolla specimens continued to come to light for over a year, so a lot of specimens were available Keep in mind that the soft, blue chrysocolla is very easily bruised or damaged You can still find good examples of these lovely specimens at the major shows in dealers' stocks, many of which are slightly damaged Cuprite does have a conchoidal to uneven fracture, but those that have survived the journey from Africa and, sometimes, careless handling are among the prettiest specimens of this superb copper oxide ever mined anywhere

Cuprite is certainly one of the more interesting copper species that has come to light Unfortunately, its soul mates from these same copper mines are among the world's most colorful and spectacular minerals It is hard for cuprite to compete next to azurite, malachite, dioptase, gem silica, chrysocolla, and many more. But to the advanced collector, cuprite certainly deserves a spot in any collection drawer I say in the drawer because cuprite is affected by light, so keep it covered and you'll be able to enjoy its vibrant red color for years to come

CAPE MAY

FIELD TRIP



These tumbled, polished gems (above left) from Cape May's tuned beach become water-clear gems with a diamondlike (above right) the rough stones are (right), the better they are likely to tumble and polish. (Photos by the author)

Collecting Quartz Gems on a New Jersey Beach

by Robert Beard

Beaches are normally meant for swimming and sunbathing, and rock collectors are usually left out in the cold when it comes to a beach vacation. Shells and the occasional shark tooth can be found, but mineral collecting opportunities at or near the beach are few and far between.

Cape May, New Jersey, however, offers a unique mineral collecting experience. Sunset Beach, located just west of the town of Cape May, has an abundance of quartz pebbles that, when tumbled, become water-clear "Cape May diamonds." Cape May diamonds are quite striking. The finished stones exhibit clarity and refraction that are comparable to Herkimer diamonds, which are the gem quartz crystals found in New York State.

Cape May is located on the southwestern tip of New Jersey, and is a major tourist area. Unlike most beaches in New Jersey, the beaches on the western side of Cape May face west. This allows them to get maximum sun in the afternoon, and makes them among the best beaches in the state to visit. Anyone who has been on an East Coast beach facing east as the afternoon sun goes down can appreciate this fact.

I had first read of Cape May diamonds in *Gem Trails of Pennsylvania and New Jersey*, by Scott Stepananski and Karenne Snow (Gem Guides Book Co., Baldwin Park, California). This has been an excellent guide for finding collecting localities in the area, and I was optimistic that their listing of the Cape May diamonds locality meant it was a worthwhile place for visiting and collecting.

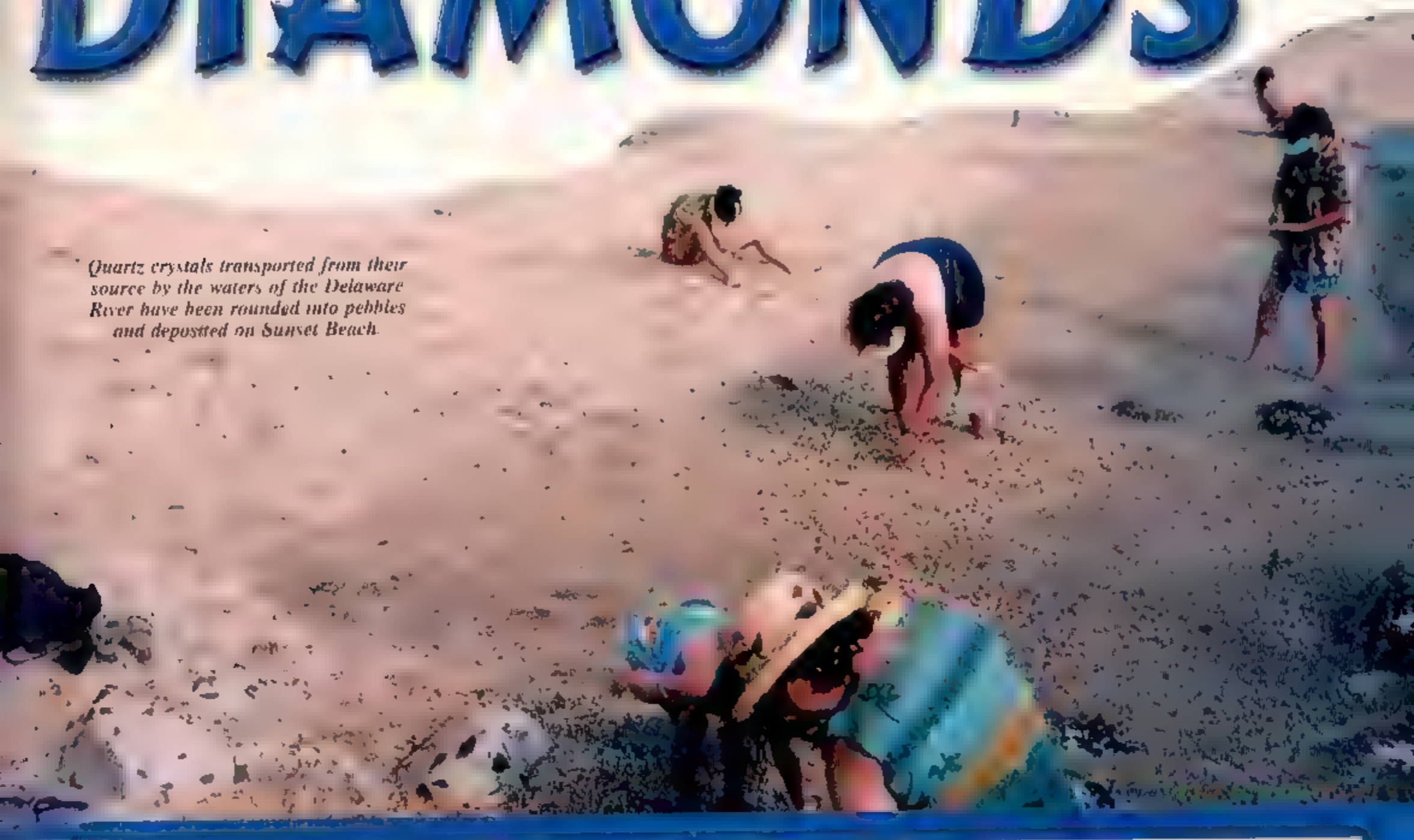
I visited Cape May with my family in August 2001. Being a major tourist area, access is good, but most importantly, visitors to the beach are actually encouraged to look for and collect Cape May diamonds. Many tourist places with interesting minerals or gemstones strictly limit or prohibit any rock hunting, so this was a welcome change.

The U. S. Geological Survey quadrangle for the area is Cape May, New Jersey. However, unlike many collecting sites, you do not need a quadrangle to find it. Any decent New Jersey road map will do. Since we came from Pennsylvania, we took the Atlantic City Expressway to the Garden State Parkway, and then took the roads at the end of the parkway into Cape May. In Cape May, we turned right onto state Route 606, which became Sunset Boulevard. This took us right to Sunset Beach.

When traveling through New Jersey, it is strongly recommended that you stay on the parkways, expressways, interstates, or the turnpike. The road maps will show many secondary roads that look like they are good shortcuts, but they can add hours to your trip. New Jersey has a much denser population than most states, and these secondary roads have lots of stop signs, traffic lights, and traffic.

The Cape May diamonds are found mainly in the southern section of Sunset Beach, which is at the western end of Sunset Boulevard in Cape May. We found that there was adequate parking, and it was free, which was also a welcome change from many of the Jersey

DIAMONDS



Quartz crystals transported from their source by the waters of the Delaware River have been rounded into pebbles and deposited on Sunset Beach.

beaches. The parking lot is bordered by gift shops and a grille, so you can also shop and eat.

After carrying our gear to our beach site, I returned to the gift shops to get oriented. The shops are collectively known as the Sunset Beach Gift Shops, and have been family-owned and operated for over 20 years. Examples of Cape May diamonds were in the display cases near the registers. When I asked to see one, I was first shown a rounded white quartz pebble. "That's it?" I thought. "What's so special about that?"

But then, without my asking, the clerk showed me some tumbled stones. I had never seen anything quite like them. They were well rounded, but nearly water clear. Even in the darkness of the gift shop, they sparkled. These were brilliant stones, and they well deserved to be called diamonds.

The clerk said that most were pebble size, but that occasionally a larger piece could be found. The shop had an example of a large unpolished stone, and it was about half the size of an egg. It was broken along one side, and I could see that the interior was translucent gray quartz. The clerk told me it had been found on the beach, and that the largest stones were often found after big storms. The beach had been picked over pretty well, and the largest stones taken, but he was sure that we could find some good potential diamonds with little effort on Sunset Beach.

Now that I knew what to look for, I was much more encouraged about finding some good Cape May diamonds. The key was to look for rounded pebbles of translucent quartz. The more translucent they were, the better they were likely to tumble and polish.

The brochure I got from the Sunset Beach shops has an excellent summary of the history of the area, and much of the following information is taken from it. Cape May Point was the tribal headquarters of the Kechemeche Indians, who were part of Lenni-Lenape Council, blood affiliates of the Algonquin Nation. The Kechemeche were reportedly the first to find Cape May diamonds, and they attached great value to the stones. One of the largest of their stones was presented to an early Dutch settler, who had it sent back to Amsterdam, where it was cut and polished into a beautiful gem. No further information was given on what became of it. If it still exists today, an admirer might find it hard to believe that it came from New Jersey if he did not know about Cape May diamonds.

The diamonds go their start as quartz crystals that formed in the Precambrian and early Paleozoic rocks in the Delaware River highlands. The upper reaches of the Delaware were about 200 miles upstream, and the crystals formed pebbles as they were transported down the drainage basin during the last Pleistocene Ice Age. Upon reaching the mouth of Delaware Bay, they were moved swiftly by the incoming and outgoing tides. Cape May protrudes southwestward from the rest of New Jersey and extends across nearly half of Delaware Bay. The mouth of the bay is 17 miles across, while the belly of the bay is 26 miles across. This causes a strong flow on both the incoming and outgoing tides, which further works to polish and deposit the stones.

Sunset Beach also has another unique historic feature that aids in depositing the quartz pebbles. This is the wreck of the Atlantus, a concrete ship that ran aground off the beach in 1926. The strong tide comes against the remains of the Atlantus and this acts as a further mechanism to deposit the quartz pebbles along Sunset Beach.

continued on next page

The Atlantus has an interesting story of its own. During World War I, the United States experienced a critical shortage of steel. Steel was crucial for ships, and the government experimented with many alternatives, including concrete. An emergency fleet of 38 concrete ships was planned by the United States Shipping Board, but only 12 were put into service.

The Atlantus was the second prototype, and was 250 feet long with a displacement of 3,000 tons. It was built with a 5-inch thick hull of special concrete aggregate to correct shattering and brittleness problems found in the first concrete ship. The ship was built by the Liberty Shipbuilding Corp. of Brunswick, Georgia. She was launched on November 2, 1918 at Wilmington, North Carolina, which was a few days after the armistice was signed. She was commissioned on June 1, 1919 and served for a year as a government owned but privately operated commercial coal steamer in New England.

While concrete is relatively light compared to steel, and has a high compressive strength, it has a weak tensile strength. This means that concrete does not bend or flex much without breaking. It took a lot of concrete to build a ship, and this made them extremely heavy. Despite the advances in aggregate technology of the day, this must have been a terrifying ship to be in during a storm, especially if you knew much about concrete.

The more traditional and efficient steel ships became available again after the war. The Concrete Fleet was decommissioned, and the Atlantus was sent to the "bone yard" at "Pigs Point" in Norfolk, Virginia, in September 1920. A year later, the Atlantus was purchased by a salvage company and stripped.

In 1926, the Atlantus was towed to Cape May in an attempt to start a ferry service from Cape May to Lewes, Delaware. While awaiting modifications to the shore for the ferry service, the Atlantus broke free of her moorings during a storm on June 8, 1926 and went aground. Several attempts were made to free her, but they were futile. She now remains as a broken hulk off Sunset Beach, breaking down further with each passing year and storm.

Once we got situated on the beach, it was time to look for some potential diamonds. This is one of the few places a person can swim and look for rocks at the same time. Unfortunately, the pebbly beach can be tough on your feet, and I found walking barefoot along the surf to be a little tough. You may want to bring some old shoes to wear if you do not want to get sore feet.

We also found that the beach drops off fairly sharply to a depth greater than 5 feet only a few feet from shore. This is much different than many of the beaches on the east coast of New Jersey, where you can sometimes go out for 100 feet and be only be a couple of feet deep. If you have small children, you will have to watch them very closely, and life jackets or "floaties" for their arms are recommended.

Millions of quartz pebbles lie on the beach, and it is very easy to find good, translucent stones. Despite the collecting done by thousands of visitors a year, more good stones wash ashore all the time. If this place has not been picked clean by now, my guess is that it never will be.

I first hunted for stones on the beach, but then went into the surf with a large metal strainer that I often use for metal detecting on beaches. This is a large steel scoop with a handle and holes that are just small enough to hold a dime, but large enough to allow wet sand to shake through. I thought this would act as an effective screen for the larger pebbles, but all I got were larger rocks that were not quartz pebbles. Many of the most translucent pebbles in the surf were smaller than a dime and fell through my screen.

I soon found that the best place to look was in areas with lots of pebbles, either in the surf or slightly higher on the beach. I looked directly at the material on the surface, keeping my eyes focused on finding the largest, whitest, most translucent stones. This seemed pretty effective, and I soon had an abundance of good, white stones.

The best collecting seemed to be along the stretch of beach between the wreck of the Atlantus and the breakwater that juts out from the beach about 2,000 feet south of the wreck. This beach had the most pebbles. When I went south of the breakwater, the beach became much finer sand, which is better for swimming, but not for finding stones. I did not spend much time along the beach to the north of the wreck, but a brief walk up that way suggested that most of this section of beach was also fine sand. Apparently, the Atlantus and the breakwater to the south have been very effective at collecting the larger quartz pebbles.

We had a large group that day, including my wife, son and daughter (ages 7 and 5), two sisters-in-law, and two nieces

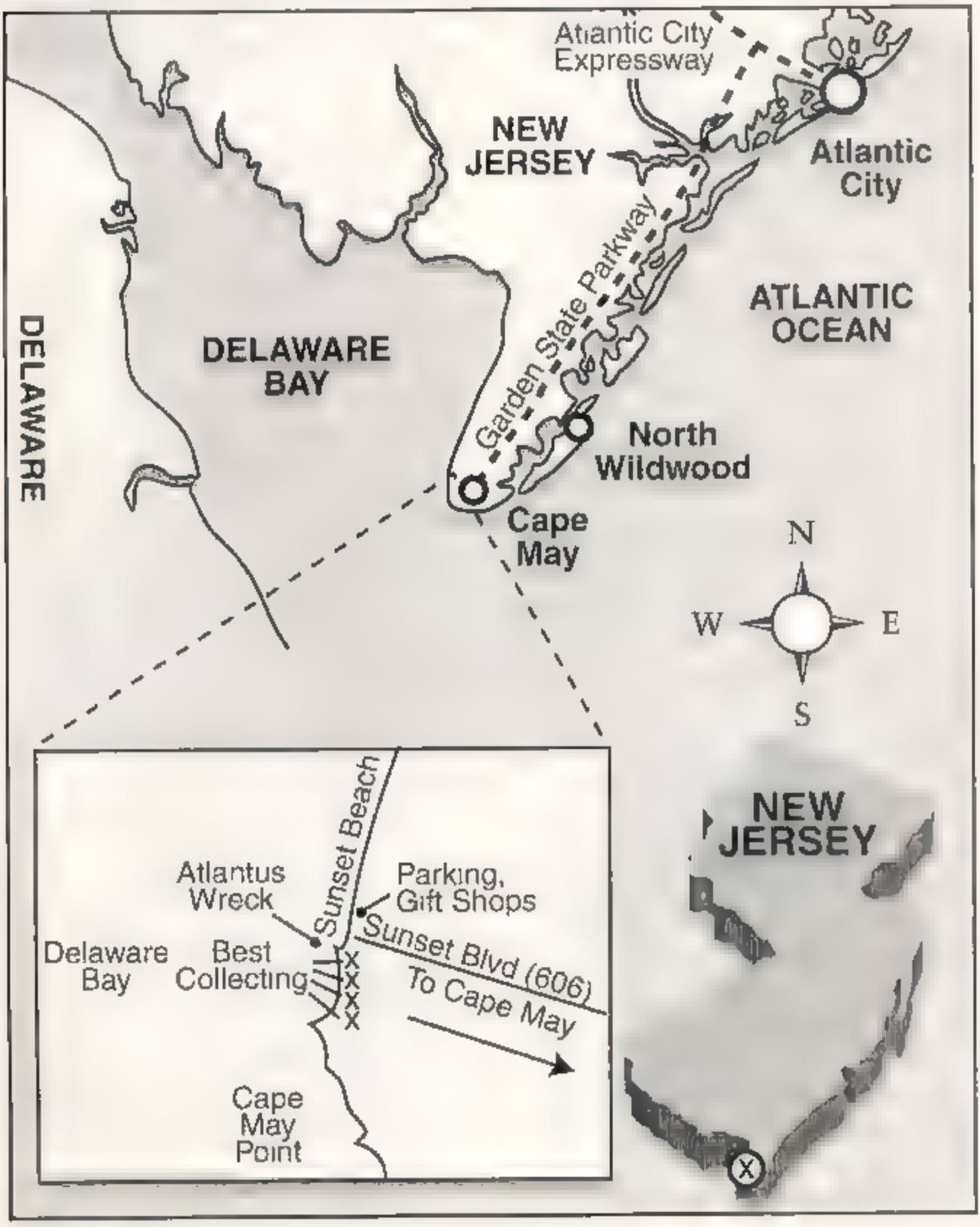
The broken hull of the concrete ship Atlantus is visible just off Sunset Beach. The best collecting is between the wreck and the breakwater just south of it.

ages 16 and 15. They also got into collecting the quartz pebbles, and soon had filled small buckets and plastic jugs with stones. They found similar material to what I had found. Many of the stones were likely to make excellent tumbled stones, based on what I had seen in the gift shop. The gift shop also sells tumblers, but rather than buy another piece of equipment on impulse I decided to further evaluate what is available on the market. I now have added a tumbler to the list of equipment I need for expanding my horizons from collecting into value added lapidary.

A few months after our beach trip, I was visiting one of my geologist friends at work, and he had a large quartz pebble on his bookcase. Usually, I am pretty good at recognizing where various minerals are from, and I decided to impress him with my knowledge that this pebble had come from Cape May. He said no, he picked it up off a beach off of Maine, and he had never heard of Cape May diamonds. However, the resemblance of the Maine pebble to the unpolished Cape May pebbles was striking. The Maine pebble very likely had a similar geologic origin, and may have started as a quartz crystal in the basement rocks of Maine. It made me wonder how good translucent quartz pebbles from other beaches would look if tumbled and polished correctly.

Sunset Beach at Cape May is one of the best collecting sites I have come across anywhere, and the site certainly ranks as one of the best places to collect in New Jersey. Unlike many collecting sites in the East, you do not have to make advance reservations, you do not have to limit how much you collect, and you do not have to pay anything. The beach is also excellent, and this makes it a good place to bring your noncollecting friends and family, as well. When in New Jersey, this is definitely the place to spend at least one beach or collecting day.

The address of the Sunset Beach Gift Shops is P.O. Box 485, Cape May Point, NJ 08212, and their Web site is www.sunsetbeachnj.com. Their phone number is (609) 884-7079. The shops are open all year. At the height of the winter storm season, you will not want to go there for the swimming, but this may be the best time to come and look for the biggest Cape May diamonds.



ROCK SCIENCE

by Steve Voynick

Irradiating Anthrax—and Gemstones

Irradiation has long been used to enhance the color of certain gemstones, but when applied in doses of unknown intensity, duration and type, the results can be detrimental. That's the conclusion of the Gemological Institute of America (GIA) after studying the irradiation measures being used by the U.S. Postal Service to kill anthrax spores spread through the mail in the wake of the September 11, 2001 terrorist attacks.

Anthrax is caused by Bacillus anthracis, a rod-shaped bacterium common in soil. In humans, anthrax can infect the skin, lungs, and gastrointestinal tract, sometimes with high fatality rates. Bacillus anthracis is tough to eliminate because it forms microscopic spores that can remain dormant (and lethal) for decades. When anthrax spores turned up in the U.S. mail in October 2001, the Postal Service immediately sought ways to counter the threat. For treating huge volumes of mail as quickly as possible, irradiation was considered the best available technology.

Irradiation refers to emission of electromagnetic (radiant) energy, which ranges in wavelength from gamma rays to radio waves, and includes visible light. The main types of irradiation capable of quickly killing anthrax spores and other microbes are nuclear radiation (alpha and beta particles and gamma rays), X-rays, and electron beams. High-speed electron beams emitted by linear particle accelerators are proving best-suited to the job of countering the threat of anthrax in the mail.

In operation, a continuous conveyor carries a flow of flat mail articles through a beam of electrons that can penetrate approximately a half-inch into most materials. Upon striking microorganisms, the electrons, which travel nearly at the speed of light, either kill them outright by ionizing cellular components to disrupt cellular chemistry, or by rendering them unable to reproduce by destroying their fragile deoxyribonucleic acid (DNA) chains. Unfortunately, electron beams also affect certain inorganic materials, including pharmaceuticals, magnetic storage media such as chips, disks and tapes, photographic film, and gemstones.

Topaz provides an excellent example of the effects of electron-beam irradiation on gemstones. Virtually all topaz available on the market today has been color-enhanced by irradiation. When mined, most topaz is colorless and has relatively little gemstone appeal. But controlled irradiation treatment can create a lovely and highly marketable blue color. When gemstone irradiation techniques were first developed, clear topaz was subjected to neutron streams emitted by nuclear-radiation sources. More recently, however, topaz has been color altered by exposure to intense electron beams.

These high speed electrons penetrate the topaz crystal to strike individual atoms within the topaz molecules, displacing these atoms from their molecular positions and leaving "holes" that trap electrons. Light energy then excites the trapped electrons, causing them to vibrate and to absorb and reflect visible light in very specific wavelengths.

In topaz, these trapped electrons create two types of "color centers." One reflects blue, while the other, which is much less stable, reflects yellow-brown. Following electron beam irradiation, topaz is usually heated to allow the unstable yellow-brown color centers to return to their original atomic state. This leaves only the stable blue color centers which create the delightful, clean blue seen in irradiated blue topaz. But additional electron-beam irradiation—such as that now used by the Postal Service—can upset the delicate atomic balance in irradiated topaz. It can also alter the atomic structures, and thus the colors, of other irradiated and nonirradiated gems and gemstones.

To prove that, the GIA recently conducted tests in cooperation with the San Diego, California-based SureBeam Corp., the manufacturer of the Postal Service's electron-beam equipment. The results showed that electron beam irradiation, at levels and durations used by the Postal Service, turned white cultured pearls to gray, pale blue sapphires to deep orange, and pink kunzites to green. Diamonds, interestingly, showed no perceptible color change.

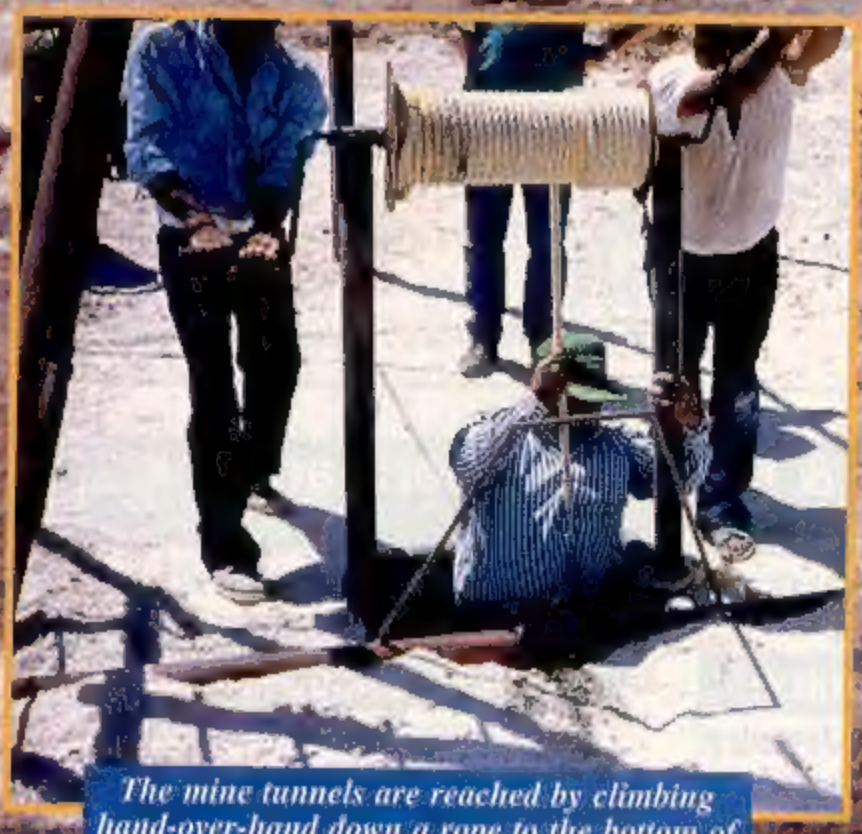
Currently, the Postal Service is irradiating only small amounts of mail, generally letters and larger flat envelopes. But because the Postal Service does deliver large numbers of gems and gemstones, and because the irradiation program will be expanded, those in the gem industry and anyone else sending gems or gemstones through the mail should keep informed of ongoing developments in postal irradiation procedures.

The "Coconut" Geodes of Northern Mexico

Mineral Wonders from Chihuahua's Famous Las Choyas Deposit

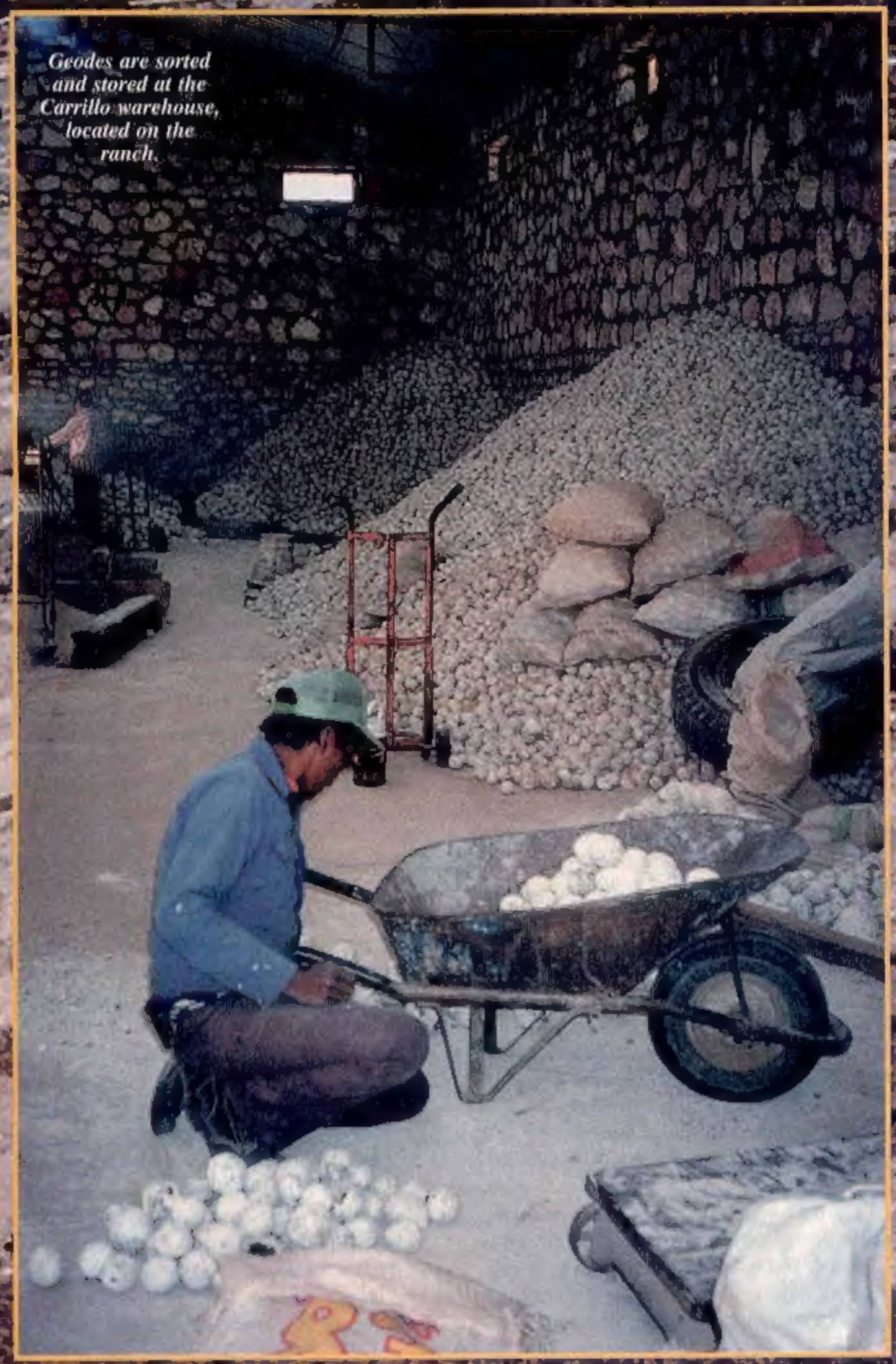
This three-chambered geode, or "triple," is especially rare because it contains all three varieties of quartz that can be found at Las Choyas: amethyst, smoky and clear. (Photos by the author)

The Las Choyas geodes are popularly known as "coconuts."



The mine tunnels are reached by climbing hand-over-hand down a rope to the bottom of a 100-foot vertical shaft.

Las Choyas geodes containing amethyst crystals may be lined with up to 17 different secondary minerals.



Geodes are sorted and stored at the Carrillo warehouse, located on the ranch.

by Brad L. Cross

Lush, grassy expanses dotted with tall oak and cactus. Clear-flowing springs and creeks. Songbirds and the occasional bison. This was the Chihuahua that Victorio, Chief of the Mimbres Apaches, probably knew as he roamed the vast grasslands along the Camino Real more than 150 years ago.

Things looked and sounded different then, in the days before the Mexican Central Railway chugged its way across the country, before Federal Highway 45 was constructed and Pemex dotted the roadside, pumping gasoline and selling frijole burritos.

Which brings up an intriguing question in the year 2002: What would one of Chihuahua's most venerable residents think if he came back to life today and peered out over the land he once inhabited?

HOW IT ALL STARTED

I imagine he'd think it was the end of the world. And he'd have a point. Everything is so drastically different, in every major way you can think of. He'd be amazed by every aspect of the culture, especially regarding food and medicine, the ability to travel great distances in a short period of time, and the ability to recover those odd, perfectly round rock balls several hundred feet below the surface.

Think for a moment of perfectly spherical geodes dotting the land's surface. That's the way it was up until 1960, when a lonesome vaquero (cowboy) picked up several of these mineral oddities. Nowadays you can find these mineralogical wonders in gift shops and rock shops in many countries. The shopkeeper will probably tell you they are from his native country—just the answer the tourist was hoping for. In reality, they come from a two-square-mile area in Chihuahua, Mexico, known as Las Choyas.

In 1961, Señor Ramon Peña filed the first claim at Las Choyas; however, it was not until 1965 that the first production of geodes occurred. The land was owned by Trinidad and Simona Carrillo, whose son Trinidad Jr. understandably denied access through the land, thus delaying production. Money, in his opinion, was to be made from cattle, not rocks. The Mesteño Ranch was a large one—some 131,576 acres—and contained all the geode production.

continued on next page

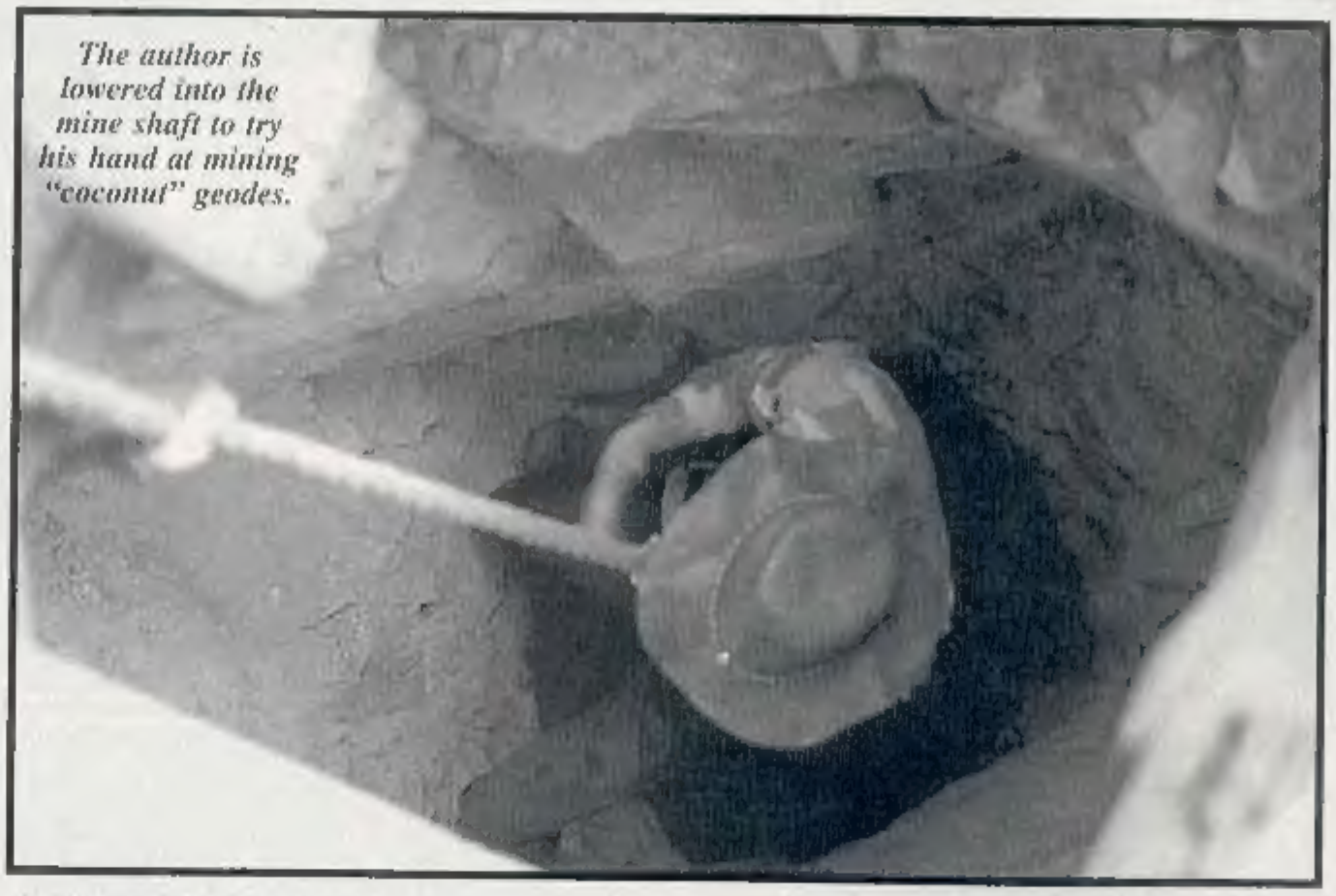
"Coconut" Geodes *from page 81*

Upon Trinidad's death in 1966, the ranch was divided among his children. Hector Carrillo, another of Trinidad's sons, manages the geode deposit today. And when Hector is rounding up and branding cattle or taking them to market, or perhaps managing one of his other ranches in the Sierra Madres, his family takes over. In fact, his wife, Jeannette, and their four sons are well known in the rock business. The Carrillos own and operate Gem Center U.S.A. in El Paso, Texas. Jeannette is not new to rocks by any means. She is the daughter of rock pioneer Ed Barry, who first opened Gem Center in 1960. Ed was noted for his stock of Mexican geodes, which he purchased directly from the Las Choyas ranch. That's where Hector and Jeannette first met.

Las Choyas boasts the largest and most abundant deposit of geodes in Mexico—and in North America. It is located about 22 miles east-northeast of Laguna Encinillas, Chihuahua. That's about 140 miles south of El Paso. These quartz geodes have constituted a multimillion-dollar business. It is estimated that over 75,000 pounds of nodules per year are mined from claims within the two-square-mile area. The geodes from this locality have been nicknamed "coconuts" because of their roundness and size. They are also called "baby coconuts," "cocos," "hollows," "solids," "coconut geodes," and "Mexican coconuts." Especially nice geodes are often referred to as "old originals," and large ones are sometimes advertised as "jumbos."

Chances are that any Mexican geode, or "coconut," you have seen in rock shops or at shows originated from the La Otra Estrella, La Animosa, El San Antonio, La Morenita, La Paty, or El Mesteño claims at this location.

Jim and Joe Miles of El Paso sold Ramon Peña's first lot of geodes from Las Choyas at the 1965 Phoenix Gem & Mineral Show. Jack Young, a premier mineral dealer in El Paso at the time, recalls how surprised all the El Paso dealers—who thought they had a pretty good handle on what was coming out of Mexico—were to see the geodes at the Phoenix show. Initially, the geodes retailed for 5 to 10 cents per pound for solids and 25 cents per pound for hollows. (Miles sorted the geodes by rolling them on his concrete patio and listening for a difference in sound. The hollow geodes made a slightly different noise than did those that were solid.) Today's prices are based on the size of the geode and its percentage of hollowness. More sophisticated methods of size sorting and determining hollowness have been developed.



The author is lowered into the mine shaft to try his hand at mining "coconut" geodes.

GEODE FORMATION

"Coconut" geodes occur as spherical cavity fillings in an intensely altered ash-flow tuff. The unit that contains the geodes is actually a volcanic glass (basal vitrophyre) altered to bentonite clay. The geode-producing unit varies from 1 foot to 5 feet thick. The unit is locally called the Liebres Formation, and is about 44 million years old, one of the oldest volcanic units in this area of Mexico.

The producing unit dips westward at 7 to 10 degrees. Therefore, the geode-producing horizon is at greater and greater depths as one goes west, away from the outcrop where it was first discovered on the Carrillo ranch. Present mining activities have average depths of 60 feet, and in certain areas can reach over 125 feet.

A large amount of solid volcanic overburden must be removed to reach the geodes. Roughly 3-foot-diameter shafts are hand-dug through the tenacious rock. Once the geode-producing horizon is reached, 1- to 3-foot-high tunnels are constructed, following the pay zone. New shafts and tunnels are constructed every 30 to 50 feet, dependent upon what the miners feel is "safe." No OSHA here! Many of the tunnels even connect with each other. Not many years ago, the vertical shafts were hand-dug through some of the toughest rock one would ever find. Imagine hand-digging a 3-foot-diameter hole 20 to 60 feet deep through tenacious volcanic rock. Needless to say, this was not only time-consuming, but resulted in a revenue loss to both the claim owner and the miner.

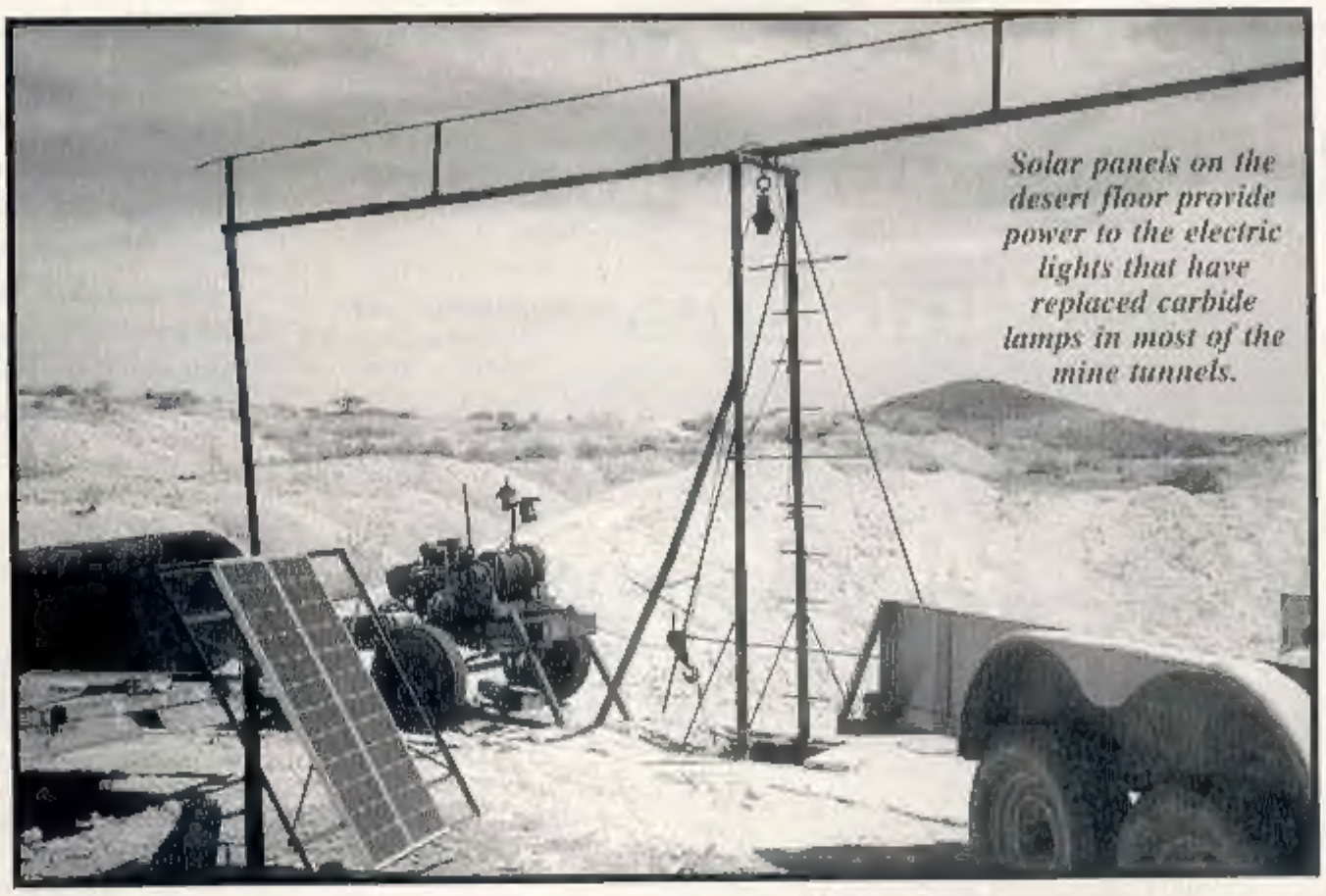
Thanks to Hector Carrillo, modern drilling methods have been brought to Las Choyas. Today, a well-drilling rig is employed, saving the miners a tremendous amount of work. A generator and solar panels provide the minimal amount of electricity needed to illuminate lightbulbs strung in most of the tunnels. At the Carrillo claims, miners no longer need to crawl on their bellies to move around in the underground tunnels; they can comfortably stand in most of them.

I estimate that one-half to three-fourths of the geode-producing horizon and its contained geodes must remain in the mined area to provide structural support. Active mines utilize a small head-frame with a rope and bucket attached to remove the underground country rock (similar to how water is drawn from a hand-dug well). The claylike material (altered ash-flow tuff) that contains the geodes is removed through the use of a small hand pick. The material is then transferred up the mine shaft and relegated to the mine dump. Once the pick penetrates or hits a geode, the miner then removes the clay by hand, freeing the geode. Geodes are often found in clusters called "pods," so once the first geode is found, care is taken to avoid damaging those others that are likely to be near it. The pods occur sporadically, and once the pod of geodes is removed, miners may dig 1 to 3 feet before another cluster is found.

It was quite an experience to slip down into a 100-foot-deep shaft, hand over hand on a 1-inch rope, into a dark maze of tunnels. It is warm and humid, and there is little air. I soon learned to master the technique of cautiously swinging a pick in hopes of finding a cluster of undamaged geodes.

The land, like any other Mexican agate or mineral deposit, has claims filed upon it. There are presently only two claim owners in the area. Access to the geode locality is very difficult, at times impossible. The roads leading into the area are poor, and during the summer months they are

usually washed out by heavy rains. A second obstacle also exists: strongly locked gates.



Solar panels on the desert floor provide power to the electric lights that have replaced carbide lamps in most of the mine tunnels.

A MINERAL SMORGASBORD

The coconut geodes commonly have a chalcedony lining that grades inward to well-defined crystalline quartz, whose apexes point toward the center of the geode. Varieties of quartz found within the geodes range from clear to smoky to amethystine. Recently, I acquired a most unusual geode from Las Choyas. It is what is known as a "triple" (three geodes or nodules welded into a single specimen), and each of the three chambers contains a different variety of quartz: amethyst, smoky, and clear with banded shadow agate. It is quite a nice example of one of Mother Nature's finest mysteries.

Many microscopic crystals can be observed in the Las Choyas geodes. It is obvious that the mineralization is quite complex, and the species identified provide clues as to the temperature at which the geodes formed. More than 18 different minerals have been observed in these geodes! These minerals occur in a great variety of colors and forms. They are extremely small—usually less than 1 millimeter long—and to the unaided eye they often appear as small, black specks on or in the quartz and calcite crystals that line the interiors of the geodes. Even the solid geodes, completely filled with banded agate, contain trace amounts of manganese oxides as dendrites located between individual bands.

When viewed in thin section, the chalcedony or agate found on the outer edge of the geodes is what geologists term "length-slow." A length-slow variety of chalcedony was deposited in sulfate-rich solutions or in evaporitic conditions, in which silica sulfate ions prevented the silica from polymerizing into chains as it does in the common "length-fast" variety (such as the banded Mexican agates).

The origin of the cavities for the geodes probably involved gas-charged spherulitic growth. When the ash-flow tuff containing the geodes was deposited, it was very hot and plastic. The basal portion that came into contact with the colder ground chilled rapidly and formed a glass, or what geologists term a "basal vitrophyre," which is highly charged with gas. When it cools, the glass devitrifies into fine-grained, round aggregates of alkali, feldspar and kaolinite. These aggregates are known as spherulites. As this crystallization proceeds, the gas held in solution in the glass exsolves and collects around the centers of crystallization (the spherulites). As more gas collects, the cavity is enlarged, often deforming or obliterating the spherulite.

It is clear that the holes in which the geodes formed were there some time before mineralization took place. This time lapse allowed groundwater to circulate through the permeable tuff and deposit silt in many of the cavities. This gave rise to a number of sedimentary structures such as graded-bedding and cross-bedding, which have been observed in a large number of geodes. Some of the geodes have been found to be completely full of silt, which shows they were filled before the secondary silica could be introduced. These are commonly known as "mud balls."

The sedimentation process may have lasted until the process of regional rhyolite intrusion began. Rhyolitic domes are found bordering the geode deposit to the east and southwest. The heat from the intrusions warmed the groundwater and started a convective process. The heated water circulated along the partings above and below the vitrophyre of the tuff containing the cavities. The water became alkaline through the breakdown of the alkali feldspar in the tuff and caused the alteration of the siliceous glass of the vitrophyre and the leaching of its silica. This silica saturation caused rapid crystallization and formation of chalcedony. So when the groundwater became supersaturated with silica, chalcedony was deposited inside the cavities. By the time the groundwater was depleted of silica and the rate of crystallization slowed, euhedral quartz had formed on the interior surface of the cavities.

The chalcedony lining is usually a blue-gray with sharp, distinct banding. Sometimes, it displays the wave effect of shadow agate. A mine-run geode from Las Choyas averages 2 to 4½ inches in diameter, and on a volume basis is 20 percent hollow.

There's only one good thing about the "good old days" being gone: I haven't lost any more money wagering with the natives on how hollow a 6-inch geode will be—especially to the nearest half-inch. The miners at Las Choyas are good at what they do. Based upon experience, they can tell you with near certainty how big the hole in a geode will be just by hefting the nodule. No one, however, not even the miners, can tell you which ones will contain amethyst and which ones won't. But never bet with them on how hollow the geode will be.

Size does matter—at least when it comes to geodes. The rough geodes are sorted into three categories: 1½ to 2½ inches, 2½ to 4½ inches, and 4½ to 6 inches. Prices vary according to size and whether a geode is hollow or not.

The geodes from Las Choyas are a true bargain by anyone's standards. It's rare anymore to buy minerals by the pound, especially specimens that contain numerous and sometimes rare minerals. Access to the deposit by the general public is off limits. Geodes lying on the surface and waiting for the taking no longer exist. Digging a 3-foot-diameter hole in the ground down to 100 feet isn't cheap and it's certainly time consuming. Once you dig down this far, there's no guarantee you'll find geodes—at least in quantities to compensate for the deep hole you just dug. Rockhounds have been known to say, "There's so much of that rock and it's so cheap, it'll be around and be this cheap forever." How many times we've been wrong!

Brad Cross, a collector and author from Austin, Texas, spent many years in Mexico collecting from and mapping the various agate beds in Chihuahua. His hardcover book, The Agates of Northern Mexico *can be purchased for $59.95 plus $4 postage from 810 E. Olympic, Pflugerville, TX 78660.*